



AGRICULTURAL ECONOMICS
OF
BENGAL

PART I



AGRICULTURAL ECONOMICS OF BENGAL

(Approved as a Thesis for P.R.S.
of the Calcutta University, 1944)

PART I

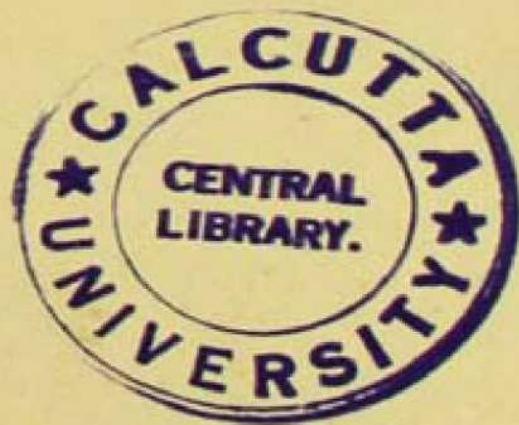
BY

PARIMALKUMAR RAY, M.A., B.L.

Professor of Economics, Bangabasi College, Calcutta, and
Lecturer, City College, Commerce
Department, Calcutta.

WITH A FOREWORD BY

DR. SYAMA PRASAD MOOKERJEE,
M.A., B.L., D.LITT., LL.D., BAR-AT-LAW,
M.L.A., M.C.A.



UNIVERSITY OF CALCUTTA
1947



Published by
THE UNIVERSITY OF CALCUTTA

338.1095414
R 212
C 3

R

TBeU 2457 FIRST PUBLISHED IN 1947

GS 1994

Printer : P. C. RAY
SRI GOURANGA PRESS
5, Chintamani Das Lane
Calcutta



DEDICATED
to
the loving memory of my mother
LATE RANI ROY



PREFACE

THIS book comprises my thesis approved for the Premchand Roychand Research Studentship of the Calcutta University for 1944. A special feature of this thesis is that it was conceived, prepared and submitted by me during my prolonged detention first under Bengal Criminal Law Amendment Act of 1930 from 1931 to 1938 and then under the Defence of India Rules from 1940 to 1946. It was as an 'internee' during 1931-38 that I had the privilege of seeing the interiors of many important districts of Bengal. I had then the opportunity of coming into close contacts with the villagers of those districts and of knowing first hand different problems of agriculture and of the agriculturists. It was during my stay in a very backward village in the district of Mymensingh in 1938 that the idea of taking up the cause of agriculture as well as of the agriculturists took a definite shape in my mind. And I plunged myself into the job in right earnest. There I could make a personal study of the various agricultural problems of a typical district of Eastern Bengal, viz., the problems of water-logging and drainage, the importance of spill-water of rivers to cultivation, the problem of jute-cum-rice cultivation, the problems of rural communication, etc., just as my earlier stay and travel in the interiors of the villages of Murshidabad had given me an idea of the problems of a typical district of Central Bengal, especially of the effects of dead and dying rivers on the adjoining countryside.

After I became free in the latter part of 1938 I tried to complement the results of my personal investigations and observations as regards the agricultural problems of Bengal with extensive theoretical studies. At the same time I conducted a tour in certain districts of North Bengal with a view to collecting informations on the peculiar problems of that region. But hardly had I completed my investigations -



I found myself back in jail in 1940. Nevertheless, I continued my work in the midst of all the handicaps incidental to prison life and finally submitted it as a thesis for P.R.S. from Buxa Jail, which was eventually approved by the University of Calcutta.

Although the work was carried out by me practically unaided, still I was not altogether deprived of the co-operating hands of others. Indeed the most important factor responsible for the maturity of the scheme conceived and carried out in the most adverse circumstances possible was the keen interest taken in my work by Dr. Syama Prasad Mookerjee even from outside. The undertone of sympathy and encouragement that each letter of his carried to me inside the walls spurred me on to action and prompted me to finish the job. Should my present work prove to be of any value to any body, the latter should thank Dr. Mookerjee for it. Dr. Mookerjee has been kind enough to keep himself interested in the latest development of my work and has finally favoured me with a Foreword.

My indebtedness also to the University of Calcutta is not insignificant. The University and its Vice-Chancellor were good enough to lend me various helps, the most important of which was their permission to submit my thesis in hand-written copies as a very special case.

Besides, I make grateful acknowledgement of the invaluable helps and suggestions received from eminent persons including Dr. Radha Kamal Mukerjee of the University of Lucknow, Professor Hari Charan Ghose of the University of Calcutta, Dr. V. K. R. V. Rao of the University of Delhi, Professor K. T. Shah of the University of Bombay and Mr. Kamlesh Ray of the Science College, Calcutta. I was also supplied with valuable materials by the Director of Agriculture, Bengal; the Deputy Director of Agriculture, Northern Circle; the Editor, *Krishikatha*; Mr. Kali Charan Ghose of the Calcutta Commercial Museum, Corporation of Calcutta; Professor J. J. Anjaria, Secretary, Indian Society of Agricultural Economics,



Bombay; the Editor, *Mysore Economic Journal*; Mr. M. D. Patel, Director and Secretary of the Institute of Agriculture, Anand; Dr. Gadgil, Director of Gokhale Institute of Politics and Economics, Poona.

At the same time I cannot but remember here those fellow prisoners of mine who ungrudgingly helped me in a number of ways during my work inside jail. Of them, I can specially mention the names of Dr. Atindra Nath Bose, M.A., P.R.S., Ph.D.; Messrs. Abinas Chandra Das, M.A., Kshiti Prasanna Sen Gupta, M.A. (Econ. & Com.), Narendra Nath Das, M.A., Kalipada Banerjee, Mrityunjaya Ray, Birendra Chandra Ghose, and my younger brother Professor Nirmal Kumar Ray, M.A. (Econ. & Eng.). My gratitude is also due to Mr. A. M. Dutt, Superintendent Rajshahi Jail, 1942, and Mr. B. Dutt, Jailer, Buxa Jail, 1944, for the facilities given by them to me for carrying out my work in their respective jails.

I must also thank Mr. S. C. Majumdar, the proprietor of the Sri Gouranga Press, for giving at my disposal the services of the Press, and also its Manager, Mr. P. C. Ray, and others for their careful and sympathetic treatment all throughout. I should also thank Messrs. Raghu Nath Dutt & Sons for their prompt supply of the necessary paper, but for which this book could not have been published so early.

I take this opportunity to express my thanks also to Dr. Nihar Ranjan Ray, M.A., D.Litt. & Phil., Bagisvari Professor of Indian Art, Calcutta University, for going through the proofs of some chapters. And I may mention that Shri Santi Sudha Ray, B.A., has helped me in preparing the index.

Finally, I owe some words of apology to my readers. In view of the importance of the book in the present circumstances I have been advised by Dr. S. P. Mookerjee and others to hasten its publication. It has, therefore, been practically rushed through the press even under the present abnormal conditions. In doing so there have obviously



been certain defects. But they are purely of technical nature, and in no way affect the intrinsic value of the book.

The book is being published in two parts so that by the time the second part is ready the first part can already be made available to the reading public. A summary of the contents of the second part is given along with the contents of this part.

PARIMALKUMAR RAY

Bangabasi College,

Calcutta,

May 29, 1947.



FOREWORD

IN most countries of Europe and especially in the United States of America the economics of agriculture has long been treated as a subject quite distinct and isolated from general economics. But in India, even though agriculture plays a far more important part in her national economy, the importance of the study of agricultural economy as distinct from the general economy of the country, does not yet seem to be fully realised. This is proved by the present dearth of literature dealing especially with the economic aspects of Indian agriculture. Moreover, agriculture was until quite recently principally a concern of the poor and illiterate peasantry. Neither the Government nor the enlightened public opinion seemed to take any great interest in it. It was, however, the last Great War and the devastating Bengal Famine of 1943 that threw into clear relief the underlying weakness of the Indian agricultural system and brought the realisation that unless attempts were forthwith made to remove these weaknesses the whole country would sooner than ever sink to a state of complete inanition. Consequently both the Government and the informed public opinion have since undertaken to solve agricultural problems apparently with the seriousness called forth by this grim prospect of the future. And various approaches are being made to rebuild Indian agriculture on a sound basis.

But a correct appraisal of facts is an essential preliminary to any such approach, even as a correct diagnosis is indispensable for the real remedy of a disease. Needless to say, a proper assessment of the facts and figures of Indian agriculture has yet to be accomplished. The writer of this book has taken great pains to fill at least a part of the big gap in the matter. He has taken Bengal as the unit of investigation and study and has fairly accurately represented



the salient aspects of Bengal's rural economy. The importance of such a work at this juncture may not be overemphasised. It will not merely be a valuable addition to the existing economic literature of the country, but would show those who want to put the agricultural economy of the province of Bengal on a sound footing the lines on which reforms are necessary. Over and above, such regional surveys would help to build a truer aggregate picture of the rural economy of the country as a whole.

Syam Prasad Krookur

CONTENTS

A. GENERAL

	PAGE
PREFACE	vii
FOREWORD	xi
CONTENTS	xiii
INTRODUCTION	1

PART I

CHAPTER I

PHYSICAL CHARACTERISTICS

I. Area. II. Boundary. III. Temperature. IV. Rain-fall. V. Regional Classification. VI. The River Systems of Bengal. VII. Soil. Appendix	... 7
--	-------

CHAPTER II

UTILISATION OF THE LAND

Classification of the Land Area. Cultivable Waste. Double Cropped Area. Area Irrigated. Distribution of the Gross Cultivated Area under Different Crops 73
---	--------------------

CHAPTER III

POPULATION

I. General Survey. II. Occupational Distribution. III. Problems of Population. IV. Low Expectation of Life. V. Problem of over-population	... 86
---	--------

CHAPTER IV

LAND SYSTEM

I. Introductory Note. II. Historical Background. III. Permanent Settlement	... ... 185
INDEX	229

B. LIST OF DIAGRAMS

No.		PAGE
1.	Map of Bengal showing the Principal River Systems	iii-iv
2.	Bengal from Gastaldi's Map of Asia ...	43
3.	Geological Formations of Bengal ...	61
4.	Percentage variation of Population in Bengal since 1872	88
5.	Density of District Population, 1931 ...	94
6.	Correlation between Rainfall and Density of Population	100
7.	Relation between Fertility and Density ...	106
8.	Movement of Death-rates in some leading countries	129
9.	Comparison of Birth-rates in India and in certain leading countries ...	140
10.	Rates of Survival	142
11.	Variation in Infant Mortality Rates in India since 1911	147
12.	Comparative Death-rates for Males and Females, Bengal	150
13.	Growth of Literacy per 1,000 of Total Population	168
14.	Map of Bengal showing the Different Systems of Land Tenure	213

C. LIST OF TABLES

No.	PAGE
1. Comparative Areas of Bengal and of some leading Countries and Provinces ...	7
2. Normal Rainfall (in inches) in the Districts of Bengal	14
3. Maercker's classification of Surface Soil ...	56
4. Results of Chemical Analysis of certain soils in Bengal	69
5. Results of Mechanical Analysis of certain soils in Bengal	70
6. Quantities of Silt present in the Padma water	71
7. Analytical Results of Padma Silt	71
8. Classification of the Land Area in Bengal ...	73
9. Classification of Land Area since 1916-17 ...	73
10. Classification of Area in the Districts, 1939-40	74
11. Percentage Distribution of the Areas in the Districts	75
12. Distribution of the Cultivable Wastes ...	76
13. Percentages of Land Utilised and Utilisable for Cultivation in the Districts, 1939-40 ...	78
14. Percentages of Cultivated and Cultivable Land, 1931	79
15. Area Cropped More than Once in the Districts	81
16. Proportion of Area Irrigated to Total Area Sown in the Provinces	82
17. Area Irrigated in the Districts	83
18. Water Area in Certain Districts	84
19. Percentage Distribution of the Gross Cultivated Area	85
20. Population of Bengal compared to those of other Countries and Provinces ... - ...	86
21. Variation in the Population of Bengal since 1872	87
22. Total Percentage Variation in Population in the Provinces since 1901	87

No.	PAGE
23. Percentage Variations of Population in the Divisions, 1872-1941	88
24. Population in the Districts of Bengal ...	89
25. Variations in Mean Density per Square Mile in Bengal	90
26. Average Density of Population per Square Mile, 1931	91
27. Density of Population with Variations per cent. by Districts, 1873-1931	92
28. Districts with Higher Density than that of England and Wales	93
29. Police-Stations having Density of 1,000 and Over	95
30. Rainfall and the Density in the Districts of Bengal	98
31. Mean Density and Rainfall in the Divisions of Bengal	99
32. Percentage Variation of Population in the Old and New Deltas of Bengal	103
33. Relation between Fertility and Density ...	105
34. Area Irrigated in Burdwan, Rajshahi and Presidency Divisions	107
35. Percentage of Irrigated or Gross Cultivated Area, 1931	108
36. Average Proximity in Yards and Acres per Person	108
37. Cropped Area per Cultivator in the Province	109
38. Variation in the Acreage of Cropped Area per Head of Agricultural Population ...	110
39. Cropped Area per Head of Total Population in the Districts	111
40. Variation in the Acreage of Cropped Area and the Movement of Population	112
41. Distribution of Population in Towns and Villages in India since 1921	112

No.	PAGE
42. Distribution of Urban and Rural Population in the Provinces	113
43. Distribution of Urban and Rural Population in the Districts of Bengal, 1931 ...	114
44. No. of Town-Dwellers for every 1,000 Rural Population, 1931	116
45. Per centage of Urban Population living in different Classes of Towns ...	116
46. Distribution of Urban and Rural Population	118
47. Percentage Variations in Urban and Rural Population in France and Germany ...	118
48. Occupational Distribution of Population ...	120
49. Percentage Variation of Working Population engaged in Agriculture	121
50. Percentage Variation of Population engaged in Agriculture in some leading Countries ...	122
51. Distribution of the Working Population of Bengal, 1931	123
52. Distribution of Workers in Bengal, 1931 ...	124
53. Occupational Distribution in the Provinces, 1931	125
54. Occupations of the People in Great Britain ...	125
55. Death-Rate per 1,000 of the same Sex and Age	127
56. Death-Rate per 1,000 in England ...	128
57. Comparison of India's Mortality with that of England	128
58. Movement of Death-Rate in India and Bengal	129
59. Movement of Death-Rate in England ...	129
60. Decline of Death-Rate in Western Europe during 1870-80 and 1901-10 ...	130
61. Death-Rate per 1,000 of Total Population ...	130
62. Comparative Income <i>per Capita</i> in different Countries	132
63. Lord Stamp's Estimate of Per Capita Income ...	133

No.	PAGE
64. Various Estimates of the Per Capita Income in India	133
65. Revenues of the Leading Countries of the World	134
66. Birth-Rate in different Countries	136
67. Births among different Occupational Groups in England	137
68. Fall in the Death-Rate and Birth-Rate between 1871-80 and 1901-10 in certain States of Europe	138
69. Birth-Rate per 1,000 of Total Population ...	139
70. Quinquennial Average of Birth-Rate in India	139
71. Variations in Birth- and Death-Rates in Bengal, per 1,000 of Total Population	141
72. Rate of Survival in England and Wales, and in British India	142
73. No. of Survivors out of 100,000 born alive ...	143
74. Mortality during the first Five years of Birth out of every 100,000 born alive ...	144
75. Infant Mortality in India	145
76. Infant Mortality in different Countries ...	145
77. Infant Mortality in the Provinces ...	146
78. Comparative Death-Rates for Males and Females, Bengal	149
79. Proportion of Females per 1,000 Males in Bengal	151
80. Production of all Grains including Pulses and Oil-seeds per head per day in the Provinces	155
81. Total Annual Food Requirements and the Amounts Available in India ...	156
82. Present Output of Principal Food-Stuffs in Bengal	158
83. Estimated Food Requirements of Bengal ...	158
84. Annual Average of Deaths from various Diseases in Bengal	160

No.		PAGE
85.	Mortality in Bengal	161
86.	Annual Toll of Malaria in Bengal	162
87.	Death-Rate per Mille in Rural and Urban Areas	162
88.	Public Health Service in Bengal, 1941 ...	164
89.	No. and Percentage of Literate Persons in the Provinces and States	166
90.	Total Literate Persons in Bengal	167
91.	Progress of Literacy in Bengal since 1881 ...	167
92.	Percentage of Literacy in different Countries	169
93.	Variation in the Number of Educational Institutions and Scholars in Bengal since 1901	169
94.	No. of Institutions and Scholars in 1931 ...	170
95.	Expectation of Life in different Countries ...	172
96.	Variation in Expectation of Life in India since 1881	172
97.	Average Expectations of Life for different Age Groups in India and England	173
98.	Average Expectations of Life in some leading Countries	173
99.	Average Expectations of Life in the Provinces of India	174
100.	Comparative Efficiency of Work in different Countries	177
101.	Work done in the Working Life of a Generation of Males	178
102.	Daily Output of Work <i>per Capita</i>	178
103.	No. of Estates under different Systems of Tenure	215
104.	No. of Estates and the Area under different Systems	215
105.	Distribution of the Land Area under different Systems of Tenure	216



A SUMMARY OF CONTENTS
OF
PART II
(In the press)

CHAPTER V
FARM ORGANISATION

Introduction. I. Different Classes of Landed Interests.
II. Causes of the Extension of Landed Interests.
III. Size of Holdings. IV. Revenue and Rent.

CHAPTER VI
AGRICULTURAL PRODUCTS

Introduction. 1. Food-Grains: (i) Rice; (ii) Wheat;
(iii) Millets; (iv) Barley; (v) Maize; (vi) Gram;
(vii) Other Food-Grains. 2. Oil-Seeds. 3. Sugar Crops.
4. Fibre Crops. 5. Fruits and Vegetables. 6. Condi-
ments and Spices. 7. Drugs and Narcotics. 8. Fodder
and Forage Crops. 9. Miscellaneous Crops. 10. Live-
stock. 11. Conclusion.

CHAPTER VII
AGRICULTURAL MEANS AND METHODS

Agricultural Means. Agricultural Methods. Need of a
thorough overhaul.

CHAPTER VIII
COMMUNICATIONS

Communications and Agriculture. Present Position.



CHAPTER IX

AGRICULTURAL MARKETING

Introduction. Problems of Agricultural Marketing. Present System of Agricultural Marketing in Bengal.

CHAPTER X

AGRICULTURAL INDEBTEDNESS

Extent of Indebtedness. Causes. Remedies.

CHAPTER XI

AGRICULTURAL FINANCE

Peculiarities of Agricultural Finance. Sources of Agricultural Finance.

CHAPTER XII

AGRICULTURAL CO-OPERATION

Introduction. II. Primary Societies. III. Central Banks. III. Bengal Provincial Co-operative Bank. IV. Co-operative Debt Settlement Boards. V. Government Assistance to the Movement. VI. Reserve Bank and the Co-operative Movement. VII. General Conclusion.

CHAPTER XIII

AGRICULTURAL INSURANCE

CHAPTER XIV

AGRICULTURAL EDUCATION

CONCLUSION

BIBLIOGRAPHY	...	...	...	...
INDEX	...	...	...	...



LIST OF ABBREVIATIONS

- A. C. Report—Agricultural Commission Report.
 - L. R. C. Report—Land Revenue Commission Report.
 - B. P. & R. E. C. Report—Bengal Paddy and Rice Enquiry Committee Report.
 - B. S. & C. Report—Bengal Season and Crop Report.
-



INTRODUCTION

Economics, as Marshall has observed, "is a study of mankind in the ordinary business of life; it examines that part of individual and social action which is most clearly connected with the attainment and with the use of the material requisites of well-being". Thus, Economics, as defined by Marshall, is a very comprehensive Science, and an Art too, dealing with the activities of man in regard, firstly, to the attainment of the material requisites of well-being and, secondly, to the use of those requisites. That is, it deals with the production, distribution and exchange of material goods which are necessary for the well-being of mankind as a whole.

Ever since Marshall tried to establish Economics as a science it has developed enormously, so much so that every one of its different branches has now assumed the character of an almost separate and independent science. In fact, every branch of the broad science of Economics has to day had its own peculiar problems as distinguished from, even if not conflicting with and contradictory to, those of its other branches, and the solutions of these different problems, too, are quite different. There is, of course, nothing new in this development. This is the rule that is discerned behind all sorts of growth. A single cell, through a continuous process of disintegration and integration, ultimately emerges as a well-developed organism having a number of quite distinct organs. The rule is, however, found not merely behind the growth and development of animal and plant organisms, but also in the progress of human thoughts and actions.

This development of the mere branches into separate and independent systems leads to the necessity of studying each branch separately. That is, it calls for specialised studies. The wider becomes the scope of human activities and the greater and greater are the accretions to human thought, the greater becomes the need of specialised studies.



So far as Economics is concerned, it has already developed in different branches, e.g., production, distribution, money, banking, international trade, finance, etc. Again, the study of each of the different factors of production, *viz.*, land, labour, capital, and organisation, and of the different problems and solutions of each, can be thorough and complete only if each factor is considered separately and independently. Such specialised studies would go on as each of the branches disintegrates more and more and develops on independent lines.

Agricultural Economics is that branch of Economics which studies land in all its aspects. The problems arising in connection with land and their solutions are very much different from those of industry. Land is a primary means of production, and it is while working on land that man is brought face to face directly with the forces of nature. In no other branch of production the attainment and the use of the material requisites of well-being are so much dependent on the natural forces as in agriculture. The location of the land, the character and composition of the soil, the influence of climate and weather, the relation to water, heat and air—all these make agriculture greatly dependent on the forces of Nature, many of which are unforeseen and unforeseeable and, as such, are either uncontrollable or can be controlled only with the application of our best resources, both human and material. Moreover, the problems of plant as well as of animal growth and preservation are also largely determined by Nature. Along with these, the problems of labour, capital and organisation are also quite different in agriculture as compared to those in industry. The problems of the peasantry and of agricultural labourers are not the same as those of the factory labourers. The nature of the capital requirements of agriculture is to be distinguished from those of trade and industry. The problems of organisation, too, are also dissimilar.

INTRODUCTION

3

All these have led Agricultural Economics to develop as a separate Science, and as an Art too, that is, as different from the Economics of Industry or Trade or Finance.

The study of Agricultural Economics as a separate branch of Science is nowhere in greater need than in this country. India being still overwhelmingly agricultural in character, agriculture forms by far the most important industry. The prosperity or adversity, the weal or woe of her people depend primarily on agriculture. Yet Agriculture is the most neglected subject. Not only it does not receive from the official quarter the care and the attention due to it in proportion to its contribution to the State Exchequer, the interest of the public in general, too, in the subject has been most discouraging. Although, however, there has been of late a change in the general attitude towards agriculture, still it remains far from satisfactory.

Speaking of Bengal, it may be said that the Province has as much as about 90 per cent of her people dependent on agriculture, but the attitude of both the Government and the public towards agriculture has been one of negligence and disinterestedness. The consequences of this apathy have been most often very serious. It is now high time that our attitude towards agriculture were completely changed. It must be carefully noted that agriculture, too, like industry, requires special knowledge and training. Particularly, modern agriculture, like modern industry, involves a lot of technical and specialised knowledge. So, in order to modernise our agricultural system, and modernisation of our agriculture is the crying need of the hour, it is essential that a large band of young men should every year come out of the Universities and other institutions, fully equipped with the theory and the practice of scientific agriculture, who will work devotionally on the fields along with the cultivators. These men should not only have specialised knowledge in the technical aspects of agriculture, but also possess a thorough knowledge of Agricultural Economics.



It may be pointed out, however, that comprehensive literatures dealing with the principles and practices of agriculture in India or in the different provinces and States are still few and far between. So far as Bengal is concerned, apart from the Official Reports, such as the Report of the Royal Commission on Agriculture or the Report of the Land Revenue Commission, Bengal, literatures containing the results of comprehensive studies of agriculture are still very rare. There are enormous fields for research and investigation in agriculture of the Province. Bengal, it may be noted, like all other big provinces of India, is bigger than many European States. So her problems alone, as apart from the problems of the rest of India, can be studied separately and the results of such studies can be incorporated in separate volumes. In fact, the narrower the field of investigation and research, the more intensive becomes the study and the investigation, and the more fruitful are the results. While recognising the value of a comprehensive study of the conditions and problems of India as a whole, we consider that such a study can best be obtained by knitting together the results of investigation and research carried out on the zonal basis. So a study and investigation of the zonal problems would not only be of particular help to the zones concerned, but would also be of greater value for the country as a whole. From both administrative and economic considerations each of the provinces and States of India can be taken as a separate zone and the problems of each can be studied separately.

The present book comprises the results of a prolonged study of and research in the agricultural conditions and problems of the Province of Bengal. We have begun with a general survey of the 'Physical Characteristics' of the Province. It has already been stated that in no other branch of production man is brought so near the forces of Nature as in agriculture. Notwithstanding the immensity of help received from Science to overcome the forces of Nature in

agriculture, the fate of agriculture still depends greatly on those very forces. If this is generally true of the advanced countries, it is particularly so of a backward country like India. So it is essential that a study of Agricultural Economics should include a study of the natural forces operating in each country. We have, therefore, included in Chapter I the Area of the Province, its Boundary, Temperature, Rainfall, Regional Classification, the River Systems, and the Structure and Property of the Soil. We have devoted comparatively a larger space to the River Systems of Bengal and dealt with not only the present position of the important Systems, but also the historical changes, probable and actual, in the course of each. It may be observed that Bengal is the Land of Rivers, and, as such, her fate is intimately connected with the rivers. So a study of the river problems, of the behaviour of the rivers—past, present and future—is essential. We must know the problems and also try to find out the solutions, if any. Changes, to take an instance, in the courses of rivers in a deltaic region are inevitable. But such changes in a thickly populated country are fraught with grave consequences. Hence arises the question of training and control of the rivers. At the same time the problems of flood and water-logging, the question of the revival of the dead and dying rivers, etc., are also matters that need be seriously attended to. But before these problems can be taken in for solution, we must have a fair idea of the problems themselves. So, we have attempted to give an idea of our river problems in the section dealing with the River Systems of Bengal.

The Second Chapter discusses how much of the land available in the Province is at present actually utilised and how much of it is utilisable.

The Third Chapter deals with Population. Population at once provides the objective as well as the principal factor of agricultural production. Hence a close study of the population problem with particular reference to agriculture is important in a study of Agricultural Economics. We



have, therefore, discussed in details the population problem of Bengal.

In the Fourth Chapter, the last Chapter of this volume, we have discussed the Land Tenure of Bengal in its different aspects.

A summary of the contents of the remaining nine Chapters has been given in the Contents. They will be published in another volume.



CHAPTER I

PHYSICAL CHARACTERISTICS

I. AREA

The entire province of Bengal has an area of 82,955 square miles. Excluding the area under the Native States of Cooch-Behar and Tripura the Province has, according to the Census of 1931, a total area of 77,521 square miles.

A comparison of the area of Bengal with the areas of some of the important countries and provinces would be interesting to note. Thus,

Table No. I. Comparative Areas of Bengal and some Leading Countries and Provinces

<i>Provinces and Countries.</i>	<i>Area in sq. mile.</i>
Bengal Presidency	... 77,521
Bombay Presidency	... 77,221
Madras (excluding States and Agencies)	122,415
Punjab (excluding States and Agencies)	99,265
United Provinces (excluding States)	106,248
Central Provinces and Berar	99,920
Bihar and Orissa	83,054
Great Britain (excluding the Irish Free State)	90,320
France	212,660
Germany	181,738
Italy	118,000
Japan (proper)	148,000
New York	49,204

Thus, taking the Province as a whole, Bengal is a little less in area than that of Great Britain, less than half the area of (pre-War) Germany and more than half the areas of Italy and Japan proper.



II. BOUNDARY AND TOPOGRAPHY

The Province of Bengal extends north and south roughly between latitudes $21^{\circ}5'N$ and $27^{\circ}N$, its northernmost point being Darjeeling situated high up in the Himalayan ranges, and the southernmost point protruding in the great Bay of Bengal. East and west, it stretches from longitude $86^{\circ}75'E$ to $92^{\circ}75'E$ and is bounded on the former side by the hills of Assam and Burma, and on the latter by undulating tracts of Bihar and Chota Nagpur, slowly rising from the east to west. Thus, on the North and East the Province is blocked by almost impenetrable barriers of high mountains and dense forests; on the South it is bounded by the Bay of Bengal and the Indian Ocean; and on the West it is flanked by the alluvial plains of Bihar and the rocky tracts of Chota Nagpur. If, East and West, it is like a trough, North and South it can be viewed as a great winnowing fan—a vast flat plain rising almost abruptly to high-ranging mountains at the northernmost end.

Under the circumstances, it is no wonder that the Province abounds in plenty of widely contrasted scenes and sceneries. One travelling as far north as Darjeeling—the northernmost district—will find himself in a pretty little town carved out of mountains rising about 8,000 feet high from the sea-level. There he can follow up with his eyes endless series of snow-clad mountain ranges, stretched from East to West, sparkling under the rays of the Sun and assuming the majesty and charm that he can hardly forget. If, on the other hand, he stands lonely on the bright little beach at Digha in the southernmost district of Midnapore with his back at the chain of sand-hills bordering the shore he will find himself face to face with the mighty waves of the Bay roaring and rumbling and splashing the land which gradually disappears in her midst. Looking ahead he can travel with his eyes, if his vision could move with the configuration of the Earth, as far as the Antarctic. Not a single obstacle is there, save and except the shape of the Earth

itself, to obstruct his eyes. Again, if he is anywhere in the Terai in the North or in the easternmost part of the Province, his eyes will be softened and soothed at the perennial green of the evergreen forests. While on the West the rocky and arid tracts will make him wonder if these form part of the same geographical area which include the evergreen forests of the north and the east. Finally, if he is somewhere in the land his eyes will be caught with the monotony of flatness of the plains surrounding him. Such diversified views are hardly to be found in any other province of India.

III. TEMPERATURE

The Tropic of Cancer passes through the Province dividing it North and South, roughly two-thirds remaining in the north and one-third in the south of the circle. So, two-thirds of Bengal lie in the North Temperate Zone and one-third in the Tropical or the Torrid Zone, and that is why it has not to suffer from very extremes of climate either-way, that is, from extreme heat or extreme cold. Although only one-third of Bengal is in Tropical Zone her climate is generally known as a tropical one. The Equator passes through a long distance off the southernmost tip of the Indian mainland, and the southernmost part of Bengal lies far away from the Equator. In January, a typical month of the Cold Season, the sun shines vertically a long way to the south of India, and the temperature, therefore, becomes gradually lower and lower from south to north. During this month the average temperature of the Province, except in a narrow strip in the mountainous tracts of the north, is found to vary as between 60° and 70° Fahrenheit, and is said to be "cold". The temperature in the mountainous tracts of the north varies from 40°F to 60°F, and is known as "very cold". The temperature of the Himalayan region beyond this tract is below 40°F and it is "extremely cold" there. But in June, which is the typical month of the Hot Season, the sun shines directly over a large part of India,



and the land generally becomes very hot. Only the hilly regions remain cool. The average temperature of almost the whole of Bengal in this month varies approximately as between 80°F and 85°F. The temperatures, however, in the above-mentioned strip of mountainous tracts in the north and in the Himalayan region beyond are found to be 70°—80°F (moderate) and below 70°F (cold). Within the Province, in the areas bordering the Sea, large rivers or lakes, the temperature remains comparatively cooler in the hot weather and warmer in the cold as contrasted with areas far away from the sea, large rivers or lakes. The districts of Bankura, Birbhum, Burdwan, and the north-western part of the district of Midnapore, for example, have generally a colder winter and a warmer summer than other districts of the Province.

These variations in temperature have got an immense significance from the agricultural point of view.

IV. RAINFALL

Rainfall depends upon the temperature and the direction of the wind, though the latter is again largely dependent on temperature. India lies within the belt of the North East Trade Winds which blow into India from about the end of October to the middle of March. This wind comes from Central Asia and, being a land wind, is dry. In the cold season the Sun shines vertically over the Tropic of Capricorn lying far south of Asia. The centre and north of Asia become very cold in the season because, first, these regions lie far north of where the Sun actually shines, and, secondly, the almost endless chains of high mountains of Central Asia keep off the warm air of the south. Thus, the air in the whole of Northern and Central Asia becomes extremely cold and heavy, while that in the Indian Ocean, which is now directly under the Sun, becomes hot and light. There is, thus, a difference in pressure between the two regions and the cold and



heavy air blows outwards from Central Asia, and during its passage to the sea, where the air is hot and light, it passes through India and Bengal. But when it enters India and Bengal it carries along with it the moist rain-laden winds collected in monsoon months in the numerous crests and troughs of the windward side of the great Himalayan ranges, and in its further journey to the sea it unloads the heavy moisture in the form of rains. This is known as the North-East Monsoon as it comes from the north-easterly direction, and the regions that get rains during this monsoon are mainly Bengal, the Madras coast and the eastern part of Ceylon. This monsoon generally lasts from the beginning of November till the end of April.

South-West Monsoon.—The Vernal Equinox falls on March 21, and since that date the Sun takes a northerly course and gradually moves north of Equator up to the Tropic of Cancer. It then shines vertically on the lands lying north of Equator, which now become intensely hot as we experience in India in the Hot or Summer Season. The entire mass of land in Northern India becomes hotter and hotter till in May-June the air over it gets sufficiently rarified to rise above and a current of moisture-laden wind rushes in from the Ocean to fill up the relative void in the air. This wind is known south of the Equator as the South-East Trade-Wind which, on reaching the Equator, is deflected due to the rotation of the Earth and takes a south-westerly direction. It enters India as a South-wester. In the course of its passage over the sea it carries the heavy rain-laden air and brings the latter into India, giving rains in most parts of the country. This rain is known in India as the South-West Monsoon. This monsoon is regarded as having two currents—the Arabian Sea Current and the Bay of Bengal Current. The former approaches India through the west coast, giving the maximum down-pour in the narrow strip of land lying in between the Sea and the Western Ghats. Some part of it carries rain as far as the eastern parts of the Punjab and the western parts of

the Himalayas. The Bay of Bengal current rises from the Bay of Bengal and proceeds north-east. It covers some parts of the east coast of India and the whole of Burma, Assam and Eastern Bengal get the rain earlier than Western Bengal and other parts of northern and central India. The south-wester, on reaching Burma, Assam and Bengal, is obstructed by the high mountains, the impact of which deflects it and forces it to take a path parallel to the great Himalayan ranges stretching from east to west. The monsoon now takes a south-easterly course and moves inland from east to west winding its way up the Ganges valley and causing rain on its way. The rainfall is, therefore, the heaviest in the mountainous regions of Assam and Burma. Cherrapunji, which is known as one of the雨iest places, and possibly the雨iest place, in the world, is situated on the outward slope of the Khasi Hills in Assam. Its annual average rainfall is about 500 inches. Rainfall diminishes as one moves west from east, Western Bengal getting much less than its eastern counterpart and Assam. So, any complete or partial failure of rains is to be witnessed only as one moves west from the borders of Assam and Burma, the degree of failure varying directly with the distance therefrom. The southern slopes of the Himalayas receive heavy rain every year as the monsoon cloud winding its way north-westward fills up the mountains and valleys and finding no outlet rises higher and higher up in the atmosphere. As a result thereof, water-vapour condenses and there is plenty of rain that feeds the mighty rivers of India, which have originated from the Himalayas. The residue that is left returns to the Sea giving autumnal and winter rains to some parts of India as North-East Monsoon. The South-West monsoon generally lasts from May 1 to December 31.¹

¹ The characteristics of the two monsoons, the direction of the moisture-laden wind and the movements of the clouds of vapour along the mountains and valleys can be best observed by one in Bengal from the 2,600 feet high hills at Baksa-Duar in the north-easternmost part of the district of Jalpaiguri.

Distribution of Rainfall.—India has been divided into four broad zones of rainfall, viz.,

- Zone I.—Having annually less than 20 inches.
- Zone II.—Having between 20 and 40 inches.
- Zone III.—Between 40 and 80 inches.
- Zone IV.—More than 80 inches.

Bengal falls within Zones III and IV. West, South-West and Central Bengal fall within Zone III, and north, north-east and south-east Bengal are in Zone IV. The normal rainfall, measured in inches, in the different districts of Bengal is given below in Table No. 2. As it appears from the table, the districts of Jalpaiguri and Darjeeling have the heaviest rainfall, Chittagong and Noakhali coming next. Of the five natural and administrative Divisions, Chittagong, Dacca and parts of Rajshahi Division have heavier rainfall than the Burdwan and Presidency Divisions, and the remaining portion of Rajshahi Division. Buxa-Duar in the district of Jalpaiguri, lying in the extreme north-east of the Province, receives the maximum rainfall.

Importance of Rainfall.—The importance of rainfall to the economic life of Bengal cannot too strongly be emphasised. Agriculture is the mainstay of the Province and is likely to remain so for a pretty long time. But agriculture is ultimately dependent on rainfall. Crops require moisture for their growth and development. Rain supplies this moisture to the soil. But rainfall does not merely supply the vital fluid essential for plant life, as it is of seasonal character in India it also determines the nature of crops to be grown, the time of sowing and reaping as well as the failure or success of the crops. Timely and proportionate rainfall would yield a successful crop and would bring wealth and prosperity to the people. On the contrary, untimely rainfall, or excessive or insufficient showers would spell disaster. In another way also rainfall leads to the prosperity of Bengal. The numerous great and small rivers that traverse Bengal, supplying water to their

AGRICULTURAL ECONOMICS OF BENGAL

TABLE 2. NORMAL RAINFALL (IN INCHES) IN THE DISTRICTS OF BENGAL
(The figures are only for headquarters of the districts)

District	Jan.	Feb.	March	April	May	June	July	August	Sept.	October	Nov.	Dec.	Total
24 Parganas	0.34	1.10	1.44	1.89	5.75	11.90	12.51	12.69	9.87	4.19	0.66	0.20	62.54
Nadia	..	0.44	1.20	1.82	2.55	7.00	10.66	11.08	10.17	8.03	0.98	0.09	58.40
Murshidabad	..	0.35	0.88	1.07	1.40	5.51	10.04	10.85	11.95	10.12	4.20	0.62	57.11
Jesore	..	0.36	1.34	2.11	3.66	8.08	12.67	12.20	10.95	8.55	4.89	1.02	66.03
Khulna	..	0.47	0.84	2.40	3.27	10.33	13.88	11.05	11.46	7.74	3.12	1.07	66.06
Burdwan	..	0.36	1.25	1.67	2.11	6.13	10.24	12.57	11.26	8.60	3.43	0.86	58.63
Birbhum	..	0.40	0.86	1.04	1.02	3.82	10.73	12.88	12.75	9.57	3.40	0.42	56.96
Bankura	..	0.51	1.04	1.25	1.32	4.84	11.09	13.11	11.47	8.74	2.91	0.64	57.00
Midnapur	..	0.46	1.20	1.43	1.87	5.32	10.50	12.53	12.22	8.75	3.64	0.88	59.05
Hooghly	..	0.34	1.21	1.51	2.37	6.00	9.87	10.97	10.72	8.12	3.87	0.66	58.76
Howrah	..	0.40	1.11	1.36	2.03	5.03	11.21	12.14	11.52	8.98	4.27	0.52	55.91
Rajshahi	..	0.35	0.58	1.20	1.78	5.57	11.17	10.81	10.32	10.04	3.73	0.49	56.10
Dinajpur	..	0.32	0.57	0.75	2.14	7.59	14.05	15.50	13.35	12.30	4.25	0.22	60.06
Jalpaiguri	..	0.30	0.66	1.36	3.73	11.07	23.73	31.28	25.04	19.94	4.90	0.20	71.10
Darjeeling	..	0.55	1.10	1.84	3.88	8.70	24.86	32.32	26.12	18.38	4.51	0.78	122.32
Rangpur	..	0.34	0.69	1.13	3.09	10.93	17.61	15.26	13.63	13.74	5.36	0.21	123.27
Bogra	..	0.38	0.78	1.24	2.27	8.50	14.03	13.06	13.29	11.67	4.96	0.74	82.03
Pabna	..	0.32	1.01	1.36	3.11	7.46	11.33	10.76	10.63	9.12	4.42	0.57	70.97
Mailda	..	0.55	0.84	0.71	1.13	4.50	10.35	10.97	11.52	10.79	4.34	0.35	60.20
Dacca	..	0.34	1.25	2.63	5.36	9.75	13.56	12.84	13.14	9.76	4.60	0.84	59.10
Mymensingh	..	0.33	0.94	2.09	5.75	12.54	18.71	16.46	15.64	13.74	5.80	0.88	74.24
Faridpur	..	0.45	1.32	2.33	4.72	9.04	13.36	12.63	12.42	9.29	4.74	1.10	92.95
Bakarganj	..	0.41	1.05	2.22	4.78	9.02	16.33	15.60	13.62	11.15	6.26	1.48	82.31
Chittagong	..	0.28	1.03	2.56	5.47	9.52	20.79	22.40	19.30	11.93	6.88	1.87	102.73
Tippera	..	0.29	1.18	2.95	6.58	11.77	18.05	15.05	15.73	10.93	6.32	1.03	90.31
Noakhali	..	0.27	1.13	2.65	6.40	11.40	21.49	24.35	26.21	16.63	8.36	1.74	120.97
Chittagong Hill Tracts	..	0.32	1.04	2.83	5.01	9.75	17.85	18.94	17.64	12.07	6.60	1.73	94.34
Baksia-Duar ²	..	0.79	2.65	2.79	8.88	20.95	45.06	40.58	40.22	32.22	6.55	1.61	201.83

* The figures for Baksia-Duar were supplied to the author, on request, by the Divisional Forest Officer, Baksa Division.
The figures are averages of 7 years' actual rainfall, i.e., from 1937 to 1944.

riparian lands, get their water supply mainly from the rainfall. If, therefore, rainfall is insufficient, the rivers either run dry or do not attain the required level and thereby fail to irrigate lands. On the other hand, if the rivers get an excessive supply, they overflow their banks causing havoc in their wake. But not only agriculture, thus, depends upon rainfall; along with agriculture trade, industry, finance, in short, every branch of economic activity is, in the ultimate analysis, dependent upon it. In fact, the entire economic well-being of the Province is dependent upon rainfall.

V. REGIONAL CLASSIFICATION

The entire Province of Bengal can be classified into following five regions:—

- (1) The Himalayan Region
- (2) The Sub-Himalayan Region
- (3) The Eastern Hills Region
- (4) The Continuation of the Slopes of Chota Nagpur Plateau
- (5) The Deltaic Region

In the Himalayan Region proper lies the northernmost district of Darjeeling. The Sub-Himalayan Region consists of a narrow strip of Terai country between the Himalayan Region in the north and the deltaic or alluvial plain in the south. The northern part of the district of Jalpaiguri, called the Duars, lies in the Sub-Himalayan Region. It may be said to be the foot-hills of the great Himalayas, although these hills rise up to 5,000 feet above the sea-level at some places. To the Eastern Hills Region belong the Lushai Hills, the little native State of Hill Tippera and the Chittagong Hill Tracts. In the fourth-class, that is the Continuation of the Slopes of Chota Nagpur Plateau, lie the three westernmost districts of Bengal, viz., Birbhum, Bankura and Midnapore, the soils of which show more affinity to the soil of the Santhal Parganas of Bihar as well



as of the Chota Nagpur Plateau rather than to that of the Province proper.

The total area, however, falling in the above four Regional classes constitutes very small proportion of the entire area of the Province. By far the greater part of Bengal is in the Deltaic Region, and Bengal is generally taken as belonging to one natural region—the Lower Ganges Valley or the Deltaic Region.³ The name is derived from the fact that the Province has been gradually built up in the course of thousands of years as a result of the delta-building activities of the two mighty rivers, the Ganges and the Brahmaputra, apart from those of a number of lesser streams whose contributions, too, in this direction are not at all negligible.

Having been constituted of the silt deposits carried by the large number of big and small rivers flowing through from the north, north-east and west, the main characteristic of the Deltaic Region is that it is unusually flat. And, as the average rainfall here falls hardly below 60 inches, it assumes a green appearance all the year round.

But the Deltaic Region, again, is sub-divided into three parts, viz.,

- (i) the Ganges-Brahmaputra Doab, or North Bengal;
- (ii) the Old Delta, or Central and Western Bengal;
- and (iii) the New Delta, or Eastern Bengal.

As the creation and present position of each of these parts are intimately connected with the workings of the various rivers of the Province, we would discuss the different river systems and their delta-building activities in the next Section.

VI. THE RIVER SYSTEMS OF BENGAL

Bengal is called the Land of Rivers. Indeed, any body looking at a map of the Province will immediately find the truth of this observation. Numerous blue lines of various

³ Cf. Dudley Stump, *The World Geography* (1931), p. 277.

dimensions intersecting the map generally from north to south bring in prominent relief the entire river system of Bengal. Like the blue veins seen through the skin of a human body, they, too, indicate the flow of the life-sustaining fluid throughout the Province. But just as the blood-circulating system in a body is classified into different systems, so the rivers of Bengal can also be divided into four main systems, viz., (1) the Northern System; (2) the Central System; (3) the Western System; and (4) the Eastern System.

1. *The Northern System.*—To this system belong all the rivers flowing in between the north of the Ganges and the west of the Jamuna or the Brahmaputra and falling into those two mighty rivers above their confluence at Goalanda. That is, all the rivers of North Bengal or of Rajshahi Division, e.g., the Mahananda, the Purnabhaba, the Atreyi, the Karatoya, the Jamuna or Jamuneswari (not the main Jamuna), the Hoorsagar, the Teesta and the Jaldhaka are included in this system. Of these, the Teesta is the most important. Before 1787, when the Teesta suddenly took her present course joining the Brahmaputra opposite Bahadurabad in the district of Mymensingh, she used to discharge her waters into the Ganges through three branches, the Purnabhaba, the Atreyi and the Karatoya.* Hence she was called Trisrota which later came to be pronounced as Teesta. The Purnabhaba, the Atreyi and the Karatoya, however, did not themselves fall in the Ganges directly. They combined with the Mahananda and then took the name of Hoorsagar which discharged into the Ganges near the present Goalanda.⁵

It is considered that North Bengal has been built up mainly by the Teesta bringing down enormous mass of detritus from the Himalayas in course of thousands of

* In 1785 Rennel, the great geographer of Bengal, found the Teesta flowing southward through Dinajpur and joining the Ganges. Cf. Wadia, *Geology of India* (1931), p. 286.

⁵ Cf. Majumdar, *Rivers of Bengal Delta* (Cal. Univ.), 1942, p. 52.

years. In this activity of delta-building the Teesta was helped by all her branches and also by the Mahananda. It is considered probable, however, that the Ganges and the Koshi rivers also contributed in building up the southern portion of North Bengal.* The Koshi river which now flows into the Ganges near Bhagalpur is thought to have originally flowed through North Bengal. The Brahmaputra, too, is considered to have had some part in the formation of the Ganges-Brahmaputra Doab as, according to Fergusson, she flowed through North Bengal once before, and this view has been supported by Mr. S. C. Majumdar, a former Chief Irrigation Engineer, Bengal.

Since the latter part of the eighteenth century, however, great changes have occurred in the courses of the rivers of North Bengal. The Koshi and the Brahmaputra had left their courses in Bengal even long before this. In 1787 the Teesta, the main delta-builder, suddenly left her course, took a south-easterly direction and joined the Brahmaputra through an older abandoned course of her own. This brought forth a revolutionary transformation in the geography of the entire Ganges-Brahmaputra Doab. All the rivers of North Bengal were deprived of their main source of supply of water. As Majumdar says, "After the diversion of the Teesta, completely cutting off the head water-supply laden with fertilizing silt from the Himalayas, these channels are gradually deteriorating bringing in their train water-logging due to inadequate drainage and progressive deterioration of the country as regards health and productivity of the soil."[†] Not only there has been a cutting off of the head water-supply of the entire northern system, but "the outfalls of the North Bengal rivers are being gradually choked by silt due to the back rush of the floods in the Ganges and the Jamuna" in the absence of the counter pressure from above. The result has been a deterioration of the drainage system of the entire North

* *Ibid.*, Pp. 51-2.

[†] *Ibid.*, p. 55.

Bengal. That explains why floods have been so common there in the current century.

2. *The Central System.*—The central system is constituted of all the rivers, or, more appropriately the spill channels, flowing in between the Ganges on the north, the Bhagirathi-Hooghly on the west and the Padma and the Meghna on the east. Before the 16th century the Ganges passed mainly through the Bhairab and the Bhagirathi, the latter of which flowed past the district of Murshidabad. The two combined in the down near Nabadwip, but again trifurcated into three branches at Tribeni near Hooghly. These branches were the Jamuna flowing east, the Saraswati flowing west, and the Bhagirathi, forming the main channel, flowing south. Apart from these there were a number of distributary channels including the Nabaganga, the Chitra, the Kobadak, the Betna and the Kodla. The Garai and the Padma were then mere minor channels.

There is no doubt that Central Bengal owes its origin mainly to the delta-building activities of the Ganges which has been carrying for centuries enormous mass of silt from her catchment area of nearly 350,000 square miles. Sir William Willcocks, the famous irrigation engineer, however, is of opinion that the south-western part of Central Bengal was built up by the Damodar which is much older than the Ganges. "The Damodar", he says, "is a very ancient river, and the original course of the main stream must have been past Burdwan, Ranaghat, south of Krishnagar, and Jessore, with its delta spread out north and south of this line".* According to him, when the Ganges came down from the west she was confined within the valley bounded on the north by the hard deposits found at Rampur Boalia and on the south by the Damodar delta. But this view has been held by Majumdar to be

* Willcocks, *Ancient System of Irrigation in Bengal* (Cal. Univ.), p. 12.



untenable.⁹ He shows that the Ganges, which flowed down the Bhagirathi up to the beginning of the 16th century, along with her branches, the Saraswati and the Jamuna, and a number of distributing channels formed up the region now known as the Central Bengal. This view has been held also by Dudley Stump. "The great delta of the Ganges and the Brahmaputra", says Stump, "has moved gradually to the east, and Central Bengal is now a land of dead and dying rivers. The place of river channels which used to carry water from the Ganges is now often taken by large swamps or bils". That the Ganges, before her diversion to the east through the Padma, flowed through the Bhagirathi-Hooghly is now an established fact. It is also undoubted that she has been the main builder of Central Bengal. That some parts of Bengal owe their origin to the delta-building activity of the Damodar is also a fact. The question is whether those parts include also a portion of Central Bengal. Indeed, if the Damodar at any time in her history flowed past Burdwan, Ranaghat, south of Krishnagar and Jessore, as observed by Willcocks, it is not improbable that she might have made some contribution to the building up of the delta even on the eastern side of the Bhagirathi. In fact, before 1770 she flowed into the Hooghly near the town of Kalna, some 50 miles north of Calcutta.¹⁰ Later on she was found to enter into the Hooghly through a branch at a point about 20 miles down of Calcutta, which was subsequently closed and died down. This dead branch is still known as Kana Damodar. But before her joining the Hooghly near Kalna she is known to have had followed almost a direct west to east course and discharged her water into the Hooghly at a point in the vicinity of Katwa which is 100 miles north of Calcutta. Gradually she took a south-easterly course changing her point of confluence with the Hooghly at the same time until she assumed her present course.

⁹ Majumdar, *op. cit.*, p. 66.

¹⁰ Cf. Article on "Damodar River" by Kamalash Ray of the University College of Science in *Science and Culture*, Vol. IX, No. 3.

TSCU 2457

The reasons for the shifting of the Damodar are not far to seek. Rising from a height of 2,000 feet in one of the oldest rocky regions of India, which are practically denuded of forests, she has been carrying vast quantities of sand and silt for centuries and depositing them along her course, and thus raising the level of her bed. She had, therefore, to seek newer and newer courses as the older beds were silted up, and in this search she was forced by Nature as well as by man to follow a gradually shifting southerly course. Actually the river has shifted fanwise making Burdwan as the apex, and the lower reaches beyond that town moved from Katwa, 100 miles to the north of Calcutta, to her present confluence with the Rupnarain, some 40 miles down of Calcutta. And, it may be observed that her present course has been similarly silted up and the river bed is already much higher than the surrounding country-side at many places, thereby making it impossible for the banks to hold the increased volume of her water during the rains. This explains the devastating floods that have been so common on the Damodar in recent years. The river is now seeking a new course and it is feared she may once again force open the great bend at Selimabad and take up her old course and proceed due east to join the Hooghly far north of Calcutta. We shall discuss the problems of the Damodar in some details presently. Here what we want to say is this that the Damodar being a very ancient river and carrying through centuries enormous mass of detritus and depositing the same along her course, the contention of Willcocks that she had some hands in the building up of at least a part of Central Bengal might have some element of truth.

So far as the present river system of Central Bengal is concerned, a glance at the map of Bengal will bring to us in clear relief in succession the Bhagirathi, the Bhairab, the Jalangi, the Mathabhanga and the Garai—all of them being the spill channels of the Ganges. Of these, the Bhagirathi, the Jalangi and the Mathabhanga are known as the "Nadia

GS 1994



Rivers". When the Ganges flowed through the Bhagirathi all the spill channels and all other distributary channels also were in good order. But since the Ganges relieved herself of the responsibility of all these feeder channels the latter, deprived of their head water-supply, could not retain long their ancient glory and fast deteriorated. The Bhagirathi now remains virtually cut off from the mother Ganges except during the rains. Even in the rainy season its present share of flood water of the Ganges is insignificant. As Mukerjee shows, from 1822 to 1923, that is, for a period of 101 years the Bhagirathi was closed for boat traffic for a total of 58 years.¹¹ During the same period it was open with a depth of—

- (a) 1 foot 6 inches for 4 years;
- (b) 1 ft. 6 inches to 2 ft. for 20 years;
- (c) 2 ft. to 3 ft. for 35 years.

From 1885 to 1923, that is, for a period of 38 years, it was closed for traffic for 23 years. In these conditions the inevitable has happened, that is, almost all the branches of the Bhagirathi, including the holy Jamuna and the Saraswati, are now practically dead.

The Bhairab, the second spill channel coming down from the Ganges almost parallel to the Bhagirathi, is also a dead river to-day. The Jalangi and the Mathabhanga, the other two spill channels which come in succession out of the Ganges, though not yet completely dead, are unable to draw in as much water from the Ganges as is necessary to keep the distributary channels in running condition.¹² The Jalangi was closed for boat traffic for full 17 years from 1906 to 1923 as compared to only one year from 1885 to 1905. The Mathabhanga was closed for 15 years during the 17 years from 1906 to 1923.¹³ Simultaneously, the various distributary channels, e.g., Betna, Kobadak, Chitra, Naba-

¹¹ Cf. Mukerjee, *Rural Economy of India* (1926), p. 174.

¹² Cf. Majumdar, *op. cit.*, p. 76.

¹³ Mukerjee, *op. cit.*, pp. 175-6.

ganga, etc., which carried spill water over the entire Central Bengal, are also in a very precarious condition. Most of Central Bengal has, as a result, been water-logged and a great portion has been converted into swamps and jungles, and so rendered unfit for human habitation. The only spill channel which draws a considerable volume of water off the Ganges is the Garai. It shows signs of further development, and along with Madhumati it is now contributing to the building up of the delta.¹⁴ Recently, however, the off-takes of all the Nadia rivers have been showing signs of improvement. This is considered to be the result of pressure that water of the Ganges is putting on them on account of the railway bridge at Sarah, which is acting as a barrage on the river.

3. *The Western System.*—To this system belong all the rivers originating in the hills of the Santhal Parganas and Chota Nagpur. They enter Bengal from the west in the order noted below: the More, the Bakreswar, the Ajay, the Damodar, the Dhalkishore, the Cossye and the Subarnarekha. They are all torrential rivers, that is, as there are very little covers in their catchment areas there is scarcely anything to hold the rain-water at the source, which, consequently, comes down in torrents within a few days after the downpour in the catchment areas and overflow the banks of the rivers often causing serious floods in their lower reaches. But the level of water falls as fast as it rises, and during the winter and the greater part of the summer the rivers become generally non-navigable and even dry at places.

All the rivers of the Western System are ranked in the class of "primary delta builders," and most of Western Bengal has been built up by them. The total catchment area of all the Western Bengal rivers originating from the Santhal Parganas and the Chota Nagpur hills are roughly

¹⁴ Cf. Majumdar, *op. cit.*, p. 79.

25,000 square miles.¹⁵ The rivers are very old and the Damodar is even considered as older than the Ganges. All of them, again, originate from one of the oldest rocky regions of India. For thousands of years they have been carrying hundreds and thousands of tons of coarse silt and, on reaching the flat countries in the lower reaches, depositing it on their beds and on the adjoining lands. Greater part of Western Bengal has, no doubt, been built up in this way. The eastern portion of the district of Burdwan, for instance, is considered to have been thus built up by the Damodar and the Ajay; the western parts of Hooghly and Howrah by Damodar alone; and the eastern portion of the Midnapore district by the Cossye (Kangsavati). In fact, the eastern portion of Western Bengal is even today deltaic in character. Particularly in the south-eastern portion of Midnapore district the sea is receding and land is gradually rising up from the bed of the Bay along the entire coast. This is due to the deposit of a large mass of sand and silt carried each year by the rivers such as the Rupnarain, the Haldi, the Rasulpur, the Subarnarekha, etc., from their sources lying far distant in the hills of Chota Nagpur. The tidal character of all these rivers, which fall far down either in the Hooghly or in the Bay, has also some part in elevating this part of Midnapore district.

The present behaviour of all these West Bengal torrential rivers is more or less similar to that of the Damodar. The beds of all have been largely silted up and 'chars' are formed at various places on the beds. This makes them unable to hold the sudden on-rush of flood coming down from the Chota Nagpur hills, and as the natural spill has been prevented by the thoughtless construction of high embankments in their lower reaches, they almost every year force their way by causing large breaches in the embankments sweeping everything before them. Thus, there is a recurring loss of life and properties in these

¹⁵ *Ibid.*, p. 66.

areas. As contrasted with the large rivers like the Padma, the Brahmaputra and the Meghna of East Bengal, these smaller rivers of West Bengal are more dangerous in certain respects. People living by the side of the former are fairly acquainted with their behaviours. In the absence generally of any embankment the flood water of those rivers gradually spill over large areas and people naturally get themselves prepared for it. Even the crops there adjust themselves to the gradual rise of water-level. But the rivers of West Bengal generally appear, except only for some weeks during the rainy season, to be quite innocent and harmless. But suddenly they take a dreadful appearance, swelling and surging and forcing open their bunds causing in their wake death and devastation and untold suffering to the people. And, the human interference in the form of construction of high embankments preventing the natural spill of these rivers appears to be primarily responsible for this. As a matter of fact, the water which would have gradually spilled over large areas now gushes out suddenly through breaches caused in the embankments and catch the people almost unaware. The Damodar, for example, is bounded on its left side by three bunds running almost parallel to one another. First, there is the embankment constructed by the Government as early as 1885. Next, the E. I. Railway track running almost parallel to the river from Saktigarh to Gomoh acts as the second bund. And, the Grand Trunk Road which also runs parallel to the river and to the railway forms the third embankment. These are the three main bunds on the left bank of the river. But the two banks of the Eden Canal also serve as the fourth and the fifth bunds. Willcocks has called them "the five Satanic chains binding the Damodar". Besides the construction of these bunds on the left bank, the embankment on the right bank was removed in 1859 for 20 miles to relieve the pressure of water on the left bank. Whether the purpose of confining the Damodar to its present bed has been achieved by all these means we shall see presently. Meanwhile we

may note their effects on the people of Bengal as observed by one of the biggest irrigation engineers of the world. He says: "As I have just spent six days on the Damodar river and its canals and among the peasantry who are the principal victims of the mistakes of the last seventy years, I cannot keep silent about the wrong inflicted on the 250 villages and hamlets swamped annually with flood water on the right bank of the Damodar, on the inhabitants of 800,000 acres of land on the left bank of the Damodar deprived annually of their rights to Damodar water which they had enjoyed for hundreds and may be thousands of years, and about the very critical condition of the river Damodar itself."¹⁶ Any comment on this will be superfluous.

Like a seer Willcocks saw the danger ahead. The unprecedented flood of 1943 in the river Damodar proved to the hilt the apprehension of that great engineer. This flood far surpassed in intensity and in loss of life and damage to property the preceding two catastrophic floods of 1913 and 1919. An *Associated Press* report dated, New Delhi, the December 3, 1943, described the flood as follows: "In July this year the river Damodar swollen by heavy monsoon floods suddenly reverted to the bed it had occupied several hundred years ago. Breaking through the bund which confined it, it swelled up against the embankment of the direct Burdwan-Howrah line, the double track linking Calcutta with North India. The floods reached the top of the embankment which then gave way at many points, the bridges collapsing into the water. Continuing across country and spreading death and devastation for twenty miles, the angry river next reached the main double track line from Calcutta northward running from Burdwan to Howrah via Bandel. This too was breached at many points by the raging floods." Four miles of railway track were affected. Nine bridges were totally and one partly destroyed. "Water swelled through the breaches wherever the track hung suspended. At other places the track had gone or lay in

¹⁶ Willcocks, *Ancient Irrigation in Bengal* (Cal. Univ.), p. 81.

twisted lengths." Water 30 feet deep ran at a velocity of 7 to 8 ft. per second. However, due to the vital importance of the route for military purposes all the available resources, men and material, of the Government and the military authorities were hurled to repair the breaches, and the necessary repair was accomplished only after Herculean efforts had been made. The floods recurred several times as the work of repair was going on. Seven lak cubic feet of sand and earthwork were washed away and one and a quarter lak of sandbags were lost in course of the repair. But the repair was only a temporary affair. The Government of Bengal, forced by public criticism and seeing the possibility of the recurrence of the floods in future, appointed an Advisory Committee in December, 1943, to "advise on permanent measures to control floods in the Damodar river". At the same time the Government of India, too, appointed a Technical Committee "to investigate the problems relating to the recent Damodar river floods".¹⁷

We have dealt above with the increasing acuteness of the problems presented by the river Damodar. It should be observed that these problems are more or less common to all the Western Bengal rivers rising from the hills of Santhal Parganas and the Chota Nagpur Plateau. The district of Midnapore, through which flow past the rivers Cossye, the Keleghai and the Subarnarekha, all originating from the Chota Nagpur Plateau, has been seeing devastating floods recently in almost every year. The results have been recurring loss of crops, damage to houses and lands, untold suffering to the people, and loss of revenue to the Government. So, along with the Damodar, some solution must have to be found out for these rivers as well.¹⁸

¹⁷ Both the Committees have since reported and according to the recommendations of the latter a multi-purpose scheme for the control of the river, for irrigation as well as for generation of hydro-electric power, has been inaugurated by the Central Government.

¹⁸ We will discuss in another volume the possible solutions by which these rivers can be rendered less dangerous and more serviceable to the people of this Province.



4. *The Eastern System.*—All the rivers east of the Brahmaputra are included in this system. Excepting the Brahmaputra and her tributaries, the principal rivers of this system are the Meghna, the Gumti, the Karnaphuli, the Halda, etc. Of these, the Meghna, which is by far the biggest, separates the Chittagong Division from the rest of Bengal. It rises on the southern slopes of the Assam hills and drains down the rainfall of Surma Valley. Its catchment area is comparatively small, but as it comprises the hills of Cherrapunji, known to be the rainiest place in the world, it maintains a high level of flood during the rainy season and some flow even in the dry season. The old Brahmaputra falls into it near Bhairab bazar and a branch of the great Jamuna enters it near Munshiganj. Finally, the mighty Padma or the Ganges meets with it at the south-eastern corner of the district of Dacca. The Meghna, however, has a very little role as a delta-builder since it does not carry much silt, and whatever silt it carries it deposits on the way to its confluence with the Padma. So far as the Gumti, the Karnaphuli, the Halda, etc., are concerned, they originate from the hilly regions of the districts of Tippera and Chittagong, and are, like the Western Bengal rivers, hill streams. They, however, maintain some flow even in the dry season. Their part in delta-building is insignificant.

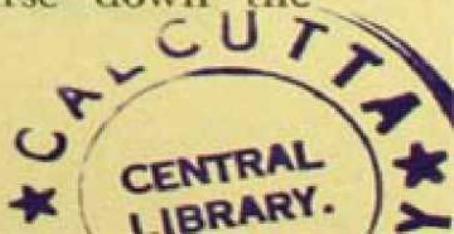
Before we proceed to take up the main delta-builders, the Ganges and the Brahmaputra, we should point out another class of rivers, which may be called a Fifth System and includes all the Tidal Rivers of South Bengal. All the rivers and channels discussed above become tidal when they reach the Bay. They are now playing an important role in building up the lower Bengal. All of them carry during their flow-tide a large volume of silt, much of which they deposit on their beds and adjoining lands before their return to the sea as ebb-tides. In this way they have become an important class of delta-builders.

The Ganges.—In the preceding sections we have dis-



cussed the different systems of rivers of Bengal where the names of the Ganges and the Brahmaputra have only come incidentally. But each of these two mighty rivers playing with the fate of Bengal is a system in herself. Unlike other rivers of the Province they are snow-fed and are perennial rivers, that is, they maintain a considerable level even in the dry season. Rising high up in the Himalayas from a region where there is almost eternal snow both these rivers reach the Bay through Bengal covering vast distances. During the monsoon, the rains, combined with the melting of the snow in their catchment basin, bring heavy floods on them. But dense forests existing in their catchment areas, a great portion of which lies high up in the mountains, help the seepage of water through the faults of the rocks during the high-water season and thus make a huge subsoil storage possible. This storage trickles down in winter and the early summer through numerous springs in the mountains and supplies the rivers with an almost steady and continuous flow of water throughout the year. Besides, the winter rains which are very considerable over a large part of the Himalayan region, and the melting of the snow in the early summer also feed the rivers in plenty in the dry season.

The Ganges rises from an ice-cave in the little Native State of Tehri situated high up in the Himalayas and falls down in great force into the plains in Hardwar (from the "Haridwar" meaning the entrance to the domain of the Lord Hari) whence she flows past the provinces of the United Provinces and Bihar, and enters into Bengal through the north-west. The river is 1,500 miles long with a catchment area of 350,000 square miles which receive an annual average rainfall of 42 inches. On reaching Bengal she flows between Malda, Rajshahi and Pabna on the north and Murshidabad and Nadia in the south, and joins with the Brahmaputra near Goalundo. It has already been pointed out that the Bhagirathi was the main channel of the Ganges till the end of the 15th century. It was early in the 16th century that she took a south-easterly course down the



Padma, then a mere minor channel, and met with the Meghna *en route* to the Bay. The Teesta then and as late as 1787 payed its homage to the queen-river Ganges. The Brahmaputra flowed east of Mymensingh till 1830 and fell into the Meghna. There was no direct linking up of the waters of the Ganges and the Brahmaputra prior to 1830.

Sir William Willocks, however, has put forward the theory that the Bhagirathi, along with other important rivers of Central Bengal, was a canal excavated by the ancient Hindu kings for purposes of overflow irrigation. "Every canal which went southwards, whether it has become a river like the Bhagirathi, or remained a canal like the Mathabhanga, was originally a canal."¹⁹ According to him, the Padma formed the original course of the Ganges. He observes that prior to the entry of this river into Bengal there were two deltas, one in the north and the other in the south-west, the latter being formed by the Damodar. The Ganges entered in between the depression of these two deltas and began her delta-building work on the old delta. But S. C. Majumdar, another irrigation engineer, has pointed out that these views of Willcocks are untenable.²⁰

Even accepting the view Mr. Majumdar has sought to establish that the Bhagirathi formed the main channel of the Ganges before her diversion through the Padma, the contention of Willcocks that Bhagiratha, an ancient Hindu King from whose name the river Bhagirathi gets her name, was a great engineer and had some hands in directing the course of the river may not be absolutely unfounded. Looking into the Geological history of India it is found that the oldest regions are the Deccan Plateau, the Assam hills and the Shan Plateau of Burma extending as far as Tenasserim in the south. The peculiarity of these regions is that they consist mainly of very old crystalline rocks that had been in existence long before the mighty Himalayas rose. In the Deccan Peninsula there are evidences of Archaen Age of the Pre-Cambrian

¹⁹ Willcocks, *op. cit.*, p. 10.

²⁰ Majumdar, *op. cit.*, pp. 65-8.

Time which is taken to have commenced from about 1912 million years ago. The Pre-Cambrian Time is the earliest division of the Geological Eras. But the Himalayas, like the Alps, are the formations of Cenozoic Period which is the last of the Geological Eras.²¹ A period of more than 1,500 million years must have intervened between the formation of the Deccan Peninsula and of the Himalayan mountains. The Himalayan mountains comprise mainly of sedimentary or stratified rocks as compared to the metamorphic or crystalline rocks of the Deccan Plateau. The Plateau covers almost the whole of peninsular India south of the Vindhya and extends upto some parts of West Bengal. There are reasons to believe that when this Plateau was formed greater part of Asia was still under water. Only the Plateaus of Arabia and of Yunnan, which are also composed of old hard crystalline rocks, are thought to be the contemporaneous of the Deccan Plateau. The great Siberian Desert, the Gobi Desert in China and the Thar or Indian Desert might have formed in the earliest ages the parts of one and the same ocean that covered the whole of Asia north of the three Plateaus named above. The entire central ranges of the mountains radiating from the Pamir Knot, lying in the north of India, as the centre, to the west as far as the Asia Minor and to the east covering the whole of East Asia through different arms including the Himalaya, the most southerly and the most important arm, raised themselves out of the sea only in comparatively recent times. The whole system is known as the "Young Folded Mountains". The fact that the Himalaya consists mainly of sedimentary rocks go to prove that it was forced out of a region that had originally remained under the sea. An additional proof of this fact is that marine deposits containing Nummulities have been discovered in the Himalayas.²²

²¹ Cf. W. B. Scott, *An Introduction to Geology* (1932), Vol. II, pp. 47, 308.

²² Cf. Mukerjee, *Changing Face of Bengal* (Cal. Univ.), p. 250.



That the distribution of the surface of the Earth in Oceans and Continents has undergone great changes in different Geological Eras is now an established fact. Without, however, following that distribution throughout the entire world in different Eras we would simply see to the possible conditions existing in the region now occupied by India. The Central Asia from the north of the Deccan Plateau was the site of an extensive sea in the Silurian Period of the Paleozoic Era.²³ In the Permian Period, the last period of the Paleozoic Era, the world was thought to have been divided into two continents—a Northern Continent that formed one land mass including Greenland, Iceland and also the Bering land, and a Southern Continent including the Antarctic Continent, the northern boundary of which extended up to the north of the Deccan Plateau. The Atlantic, the Pacific and the Indian Oceans were most probably separated in the high southern latitudes. Between the Northern and the Southern Continents was a transverse sea, a round-the-world continuation of the Mediterranean Sea, which was called Tethys. This transverse sea connected the Atlantic and the Pacific Oceans across Southern Asia (that is, through the Northern India including the Himalayan Region) and some parts of southern Europe, and widely separated North and South Americas. Excepting northern China and Peninsular India the whole of Asia has marine deposits of the Permian Period, indicating its submergence under the sea in that Period. The marine formations marking the eastern extension of the Mediterranean are found in south-west China, Tibet, the Himalayas and northern India, Afghanistan and Persia. This was also one of the most important geographical features of this part of the globe throughout the Mesozoic Era. Naturally, therefore, the Peninsular India belonged to the Southern hemisphere in type although it was not so as regards geographical position. Throughout the Permian, Triassic and

²³ Scott, *op. cit.*, p. 101; see also Wadia, *Geology of India* (1931), pp. 121-2.

Jurassic Periods there was a succession of continental formations in Peninsular India which are called the Gondwana System. The great southern Continental mass was given the name of Gondwana land from this Gondwana System. But in the Triassic Period, the last period of the Mesozoic Era, the process of sedimentation went on over the Permian beds under the Tethys. A succession of Triassic beds overlying the Permian is found in the Salt Range of north-western India and in the Himalayas as also in Asia Minor, Central Asia, Baluchistan, Afghanistan, and Burma. In the Jurassic Period the Tethys and the Himalayan Sea existed almost in the same condition as in the Triassic. In the Cretaceous Period—the last period of the Mesozoic Era—the eastern portion of Tethys made some encroachment on the Peninsular India. The western side of the Peninsula, a great basaltic Plateau, was built up in this Period. This is known as the Deccan Trap and is constituted of lava several thousand feet deep and covering an area of 250,000 square miles. We have already pointed out that in the Cenozoic Era were formed up the highest mountain ranges of the Earth including the Himalayas and the Alps. Speaking of the formation of the Himalayas, Wadia observes: "The pile of marine sediments that was accumulating on the border of the Himalayas and in Tibet since the Permian Period, began to be upheaved by a slow secular rise of the ocean-bottom. From Mid-Eocene to the end of Tertiary this upheaval continued, in several intermittent phases, each separated by long periods of time, till on the site of the Mesozoic Sea was reared the greatest and loftiest chain of mountains of the earth."²⁴ But in the earlier Cenozoic Era—that is, in the Eocene Section of the Tertiary Period, the Tethys still extended across Persia and Turkestan, north India, Borneo and Java up to the Pacific. It was only in the Neogene Section of the Tertiary Period that the whole Asiatic Continent was above the sea. But some marine

²⁴ Wadia, *op. cit.*, p. 224.



deposits of this time are found in north-western India, indicating that this part of India was still under water.

Now, after the great Central range of mountains along with its two arms, the Himalaya extending south-east and the Sulaiman to the south-west, was formed in the Cenozoic Era, a shallow sea most probably flowed in between the Deccan Plateau in the south and the Sulaiman and the Himalayan ranges in the north-west and north-east respectively. This vast stretch of water flowed in the regions now occupied by the valleys of the two great rivers, the Indus and the Ganges. But it began to be gradually filled up, possibly in course of thousands of years, through the slow rising of the bed which might have taken place as a continuation of the process that led to the formation of the great Central range of mountains. At the same time there were probably other elements of nature that were active in filling up the depression. Rains falling on the vast range of mountains streamed down the extensive mountainous regions in the form of numerous hill torrents carrying enormous mass of materials into the shallow sea. This process went on for thousands of years, gradually filling up that sea with the deposits from upland. The entire sea, save and except the north-western portion of India where only the marine deposits of the Neogene Section of the Tertiary Period are found, was filled up in this way. It was not improbable that the hill torrents originating in the Himalayas became in course of time big rivers carrying their water into the shallow sea still remaining in north-western India. Indeed, Wadia observes: "After the first, Mid-Eocene uplift of the Himalayas there were two principal gulfs, the Sind Gulf extending through Cutch, Western Rajputana, Punjab, Simla and Nepal; and the Eastern Gulf, subdivided into two by the ridge of the Arakan Yoma into the Assam Gulf and the Burma Gulf. . . . The whole Tertiary history of India is exhaustively recorded in the deposits filling up these two gulfs. As the seas dwindled and receded, they were replaced by the broad estuaries of the rivers succeeding

them, Their earlier marine deposits were steadily replaced as the heads of the gulfs were pushed outwards by the growing estuarine and deltaic sediments of the rivers superseding them."²⁵ Anyway, by the Neogene Section of the Tertiary Period the eastern portion of the great Indian depression, from possibly about the westernmost extremity of the present United Provinces to the north-west of Bengal, was sufficiently raised. The greater parts of the Punjab and Rajputana, and the whole of Sind were still under the north-western sea, and the greater part of Bengal, too, lay under the eastern sea.²⁶

When the Aryans first came to India, most probably they found a portion of north-west India still under a shallow sea where fell the waters of the Indus, the Ganges and other big rivers of northern India. As they gradually moved to the east they came to know Bengal. But it appears that they knew only the western and north-eastern parts of the latter, as other parts of the Province still remained under the sea. This is testified to by the following verse of Manu.²⁷

Āsamudrātta vai purvādāsamudrātta paschimāt'
Tayorevāntaram giryorāryyāvartam vidurvadhbā

that is, the region bounded on the north and south by the Himalayas and the Vindhyas respectively, and on the east and west by seas, was called the Āryyāvarta, or the abode of the Aryans. Thus, both on the east and west of the country lived by the Aryans there were seas or gulfs. In

²⁵ *Ibid.*, pp. 223-7.

²⁶ Cf. Mukerjee, *The Changing Face of Bengal* (Cal. Univ.), 1938, pp. 223-6. He writes : "Important changes are believed to have taken place in the main drainage lines of Northern India so late as the Middle Pleistocene, i.e., an epoch of time latter than the emergence of man. A great middle tertiary river, called the Siwalik river by Pilgrim and the Indo-Brahm by Pascoe, succeeded the eocene gulf of the Tethys Sea that withdrew after the first phase of the Himalayan upheaval. This river then carried the combined discharge of the Brahmaputra, the Ganges and the Indus, and flowed north-west throughout the entire length of Northern India. It is probable that the Bay of Bengal had extended northward to Assam rather than the eocene gulf of Northern India extended so far eastward."

See also Wadia, *op. cit.*, p. 40.

²⁷ Ch. II, V. 22.



the Aitareya Brāhmaṇa and Aitareya Āranyaka we find the names of Magadha (South Bihar), Anga (East Bihar) and Banga (only the districts of Birbhum, Burdwan, Murshidabad and Nadia),²⁸ which were known to the Aryans but remained outside the country held by them. There is no mention of Central or South Bengal, which indicates that these were in all probability still under the sea. Tāmralipti (modern Tamluk) was possibly in these earlier times the easternmost port on the open sea. The Aryans first settled themselves on the most fertile tract in the Punjab lying in between the two rivers, the Saraswati and the Drisadvati, both of which have long since been extinct. To this they gave the name of Brahmapurta, that is, the place of residence of the Lord of Creation and the importance and holiness of places east of it decreased proportionately to the distance.²⁹ Again, the region bounded on the north by the Himalayas and on the south by the Vindhyas, and on the east and west by Prayāg and Kurukshetra respectively was named Madhyadesa³⁰, of which the capital was the famous city of Ayodhyā. Tradition says that the first king of this region was Manu who had his capital in this city.

Bhagiratha was a King of Ayodhyā (the sites of which have now been found in the modern city of Fyzabad in South Oudh) and was an ancestor of the great hero Rāma. But from long before his time the Kingdom of Ayodhya had to suffer from recurring droughts which then became an important feature of this region. It may be observed that even today the United Provinces become very hot and dry in the summer. The Mahabharata says that the King Sagara, the great-great-grand-father of Bhagiratha, had 60,000 sons who perished through the wrath of the sage Kapila. Kapila said to Angshumān, the grand-son of Sagara, that if the Ganges could be brought down from the heaven the souls of the 60,000 sons of Sagara would be redeemed.

²⁸ Cf. Levi, Przyluski and Bloch, *Pre-Aryan and Pre-Davidian India*, Tr. by P. C. Bagchi (Cal. Univ.), 1929, p. 74.

²⁹ Manu, Ch. II, V. 20.

³⁰ Manu, Ch. II, V. 21.

After Angshumān came to the throne of his grand-father, Sagara, he probably tried to bring the Ganges down to his Kingdom, but failed. Then his son Dilip became the King and he, too, tried his best, but could not succeed in the adventure. Then came Bhagiratha who worked hard for a considerably long period and succeeded in persuading the Ganges to follow him down to the east through his Kingdom. This is the familiar story in regard to the descending of the Ganges on to this earth. Leaving aside the allegory it may be said that 60,000 subjects of the King Sagara once perished due to a severe scarcity of water. (The subject of the King, according to the ancient Indian scriptures, were his sons.) The Brahmin sages acted during the reign of the Hindu Kings as their Advisers. It is probable that Kapila was one of such advisers, and advised Angshumān who became King after Sagara, that the best way to free his Kingdom from scarcity and drought was to divert to the east the course of the Ganges which then flowed to the west emptying her water into the Western Sea. Angshumān ventured in this herculean job but died before he could accomplish it. His son Dilip took up the work, but he, too, could not see the success of the great project. Finally, Bhagiratha, who became King after Dilip, succeeded in diverting the great river from the west to the east.

It is difficult to find out the age of Bhagiratha. He lived long before Dasaratha and Rāma, the great hero of the Rāmāyana. More than twelve generations, at least, must have intervened between Bhagiratha and Dasaratha. Again, between Rāma and the Great War of Kurukshetra a long period must have intervened. If the date of that War be taken at about 1,000 B.C., then Bhagiratha may have lived not later than 2,000 B.C.³¹ That even in such earlier times the course of the river Ganges might be diverted through human effort, has been believed by no less an

³¹ That is the opinion of Dr. R. C. Majumdar. Cf. His *Outline of Ancient Indian History and Civilisation* (1927), p. 81. But according to Smith it is 3,000 B.C. Cf. *The Early History of British India*, p. 28.

authority than Sir William Willcocks. That such a diversion had actually taken place, has been testified to by him. He, thus, writes: "If one reads carefully the account of the *Rāmāyana* one sees that the reference is to the diversion of a portion of the perennial waters of the Ganges, which 50,000 of the King's subjects could not accomplish, but which Bhagiratha, the King's grandson accomplished by his ingenuity."³² As a matter of fact, the peoples of those ancient times were well-versed in agriculture and irrigation, and actually the great rivers like the Nile and the Tigris, both seats of great ancient civilisations, had been turned as early as 4,000 B. C. and 3,000 B. C. respectively. The Aryans in India also were skilled agriculturists and must have been expert irrigation workers. That a gigantic effort was made to turn the Ganges is proved by the fact that success was achieved only after three successive kings had worked hard for the job. Most probably, however, the entire channel had not been excavated. Only certain portions might have been cut in order to divert the river through some existing rivers flowing east into the Eastern Sea, that is, the Bay of Bengal. Or, it might have happened that only a branch was led away to the east from the main river flowing south-west, which, however, in course of time has been the main stream. The subsequent filling up of the remnants of the shallow sea existing in Neogene Section of the Tertiary Period might have had something to do in this diversion of the main stream of the Ganges through the channel dug out by Bhagiratha. There is no doubt that this filling up in the later stages were made by the great rivers flowing from the north-east, the principal of them being the Indus, the Ganges and other rivers of North India before the latter's diversion eastwards.

It must incidentally be observed that there is no rule-of-thumb for the behaviour of the courses of rivers. Rivers, by nature, must change their courses, sometimes gradually but more often suddenly and violently. Beginning

³² Willcocks, *op. cit.*, p. 13.

from the sixteenth century, as we have seen, the most important rivers of Bengal,—the Ganges, the Teesta and the Brahmaputra,—have undergone sudden and violent changes in their courses resulting in radical transformation of the face of the Province. That the Indus, too, underwent similar changes is undoubted. In fact, the courses of all the rivers of the Punjab and Sind have undergone both violent and gradual changes ever since their formation. But we have no exact knowledge of these changes happening before 712 A. D.—the year of the Arab invasion. The changes that have, however, occurred since then are stupendous. Vincent Smith, speaking of these changes, observes: "During the known period, earthquakes, floods, changes of level, denudation, accretion and alterations of climate all have contributed to transform the face of the country. The delta of the Indus has advanced more than 50 miles, and has thus lengthened the course of the rivers, while necessarily diminishing their gradients and velocity. One huge river, the Hakra or Wahindah, which formerly gave life and wealth to the desert wastes of Bikanir, Bahāwalpur, and Sind, has ceased to exist; the Bias has forsaken its ancient independent bed, and become a tributary of the Sutlej; while the other rivers, the Indus, Jihlam, Chināb, and Rāvi have all repeatedly changed their courses and points of junction." If such enormous changes could happen in the topography of north-western India in the course of only twelve hundred years, what tremendous changes might not have happened in the course of thousands of years before that!³⁴ So, there cannot be any doubt that the changes occurring since the advent of the Aryans far surpass those that have happened since 712 A. D. It cannot, therefore, certainly be said that the Ganges has from the date of her birth remained as we find her today. She, too,

³³ Smith, *op. cit.*, pp. 95-6.

³⁴ So far as Indus is concerned, it is inferred from various evidences that within historic times she had a much more easterly course and discharged her waters at first into the Gulf of Cambay and then into the Rann of Cutch. Cf. Wadia, *op. cit.*, p. 289.



must have undergone great changes in the long period of her history. As a matter of fact, the Ganges is considered to have had flowed in her earliest life to the north-west along with the Brahmaputra and the Indus, and their combined discharge, which was named by Pilgrim as the Siwalik river and by Pascoe as the Indo-Brahm, fell into the north-western sea.³⁵ There are physical and historical reasons to believe that the Jumna, too, in her earliest days, discharged her water into the Indus System.³⁶ These facts go to prove our contention that almost all the important rivers of north India at one time flowed west and emptied their waters, most probably in connected streams, in the north-western sea, called by the historians the "Rajputana Sea". Such connected or combined stream was the Indo-Brahm which, according to Dr. Radha Kamal Mukerjee, might be the great ancient Indian river Saraswati with her five branches, all emptying in the said "Rajputana Sea".³⁷ The five branches of the Saraswati along with the Ganges and the Jumna, might have made up, according to Mukerjee, the ancient seven-fold river system in Aryan India. Professor Rai Chowdhuri expresses his doubt as to whether the Saraswati ever flowed into the noth-western sea, even though the epithet *Sāgargāmini* (sea-going) has been used in the *Mahāvārata* in connection with her. That the Saraswati was a mighty river in ancient India is an undoubted fact. Whether or not, however, she was the same as the Indo-Brahm flowing into the remnants of the Tethys Sea, that is, the "Rajputana Sea", the Ganges, the Jumna, the Indus, the Brahmaputra and other great rivers of north India emptied themselves in those distant times in the north-western sea. Majumdar has expressed the possibility that the Tsanpo, as the Brahmaputra is called in her upper reaches, until very recent times,

³⁵ Cf. Mukerjee, *op. cit.*, p. 243; Wadia, *op. cit.*, p. 40.

³⁶ Mukerjee, *op. cit.*, p. 235; also Wadia, *op. cit.*, p. 41.

³⁷ Professor Rai Chowdhuri, however, has expressed his doubt regarding the theory of a "Rajputana Sea". Cf. *Studies in Indian Antiquities* (Cal. Univ.), 1932, p. 53, F.N.

flowed westward and escaped through the Himalaya at some other point.³⁸

Now, if the important rivers like the Ganges, the Jumna and the Brahmaputra at one time flowed west, then surely they subsequently, through some reasons or other, changed their courses towards the east and, instead of falling into the Arabian Sea, emptied themselves in the Bay of Bengal. Even the Saraswati which in the earliest times flowed west, gradually shifted towards the east and ultimately merged with the Ganges at Prayāg.³⁹ Wadia points out that as a result of the final phase of the Himalayan upheaval the great Central System of rivers, the Indo-Brahm, was broken up into three different systems, each system being henceforward known under a different name. The severed upper part became the modern Ganges, having in course of time captured the transversely running Jumna which represented the channel of the Indo-Brahm, and converted it into her chief affluent.⁴⁰ That even subsequent to this the Ganges might have flowed west is found in the following descriptiton of Wadia: the transverse Himalayan rivers, . . . continued to discharge their waters into this new river (*i.e.*, the Ganges) irrespective of its ultimate destination, whether it was the Arabian Sea or the Bay of Bengal.⁴¹ The facts that in the Vedas there is no mention of the Ganges and the Jumna taking a seaward course, while it is stated that the Indus, the Sutlej and the Saraswati flowed into the sea, and that, on the other hand, the Mahavarata mentions that the Ganges flowed into the sea, most probably prove that the latter at the Vedic period was a tributary of a mighty river, possibly the Saraswati, which emptied her waters into the sea, and paled into insignificance as compared with the Saraswati. That is why the Saraswati, and not the Ganges, finds so much prominence in the Vedic literature. At the time of the Mahavarata, however, there

³⁸ Majumdar, *op. cit.*, p. 61.

³⁹ Mukerjee, *op. cit.*, pp. 234-5; also Wadia, *op. cit.*, pp. 285-6.

⁴⁰ Wadia, *op. cit.*, p. 40.

⁴¹ *Ibid.*, p. 41.

had occurred a great change in the entire river systems of the North and the Ganges not only changed her course from west to east, but assumed upperhand over the Saraswati, and all the ancient literatures of India henceforward sang the glories of the new great river.

The question that arises here is whether the river had changed her course from west to east absolutely due to natural causes or human hands had any contribution in it. While nature played a great part in the form of the silting up of the earliest bed of the "Rajputana Sea," as a result of which the river took a gradually shifting easterly course, still human hands might have had some part in her taking that course,⁴² and this must have happened at sometime between the Vedic Age and the Age of the Mahavarata. All the kings beginning from Sagara to Bhagiratha, who had attempted for the diversion of the Ganges, must have flourished sometime during this period. After King Bhagiratha had succeeded in his attempt, the river gradually established her pre-eminence in her easterly course which is described in all its grandeur and majesty in the post-Vedic literature. But even after Bhagiratha had succeeded in diverting her, she has surely changed much.

We do not consider, however, that the entire channel of the river up to the sea had been excavated by Bhagiratha even though the river is known as the Bhāgirathi from her lowest reaches to as far as the United Provinces. As we have already stated, Bhagiratha's main attempt must have been devoted in his own kingdom in order to force the bend of the river to the east, and his intention was to link it up with some river already flowing through the depression lying in between the Himalayan regions on the north and the Peninsular India on the south. The existence of patches of an 'older alluvium' throughout the Ganges Valley from the Madhupur jungle in the lower reaches of the river up to the United Provinces and Bundelkhand, as observed

⁴² Indeed, as Wadia observes, "a comparatively trifling circumstance is able to divert a river into a newly scoured bed." *Op. cit.*, p. 285.

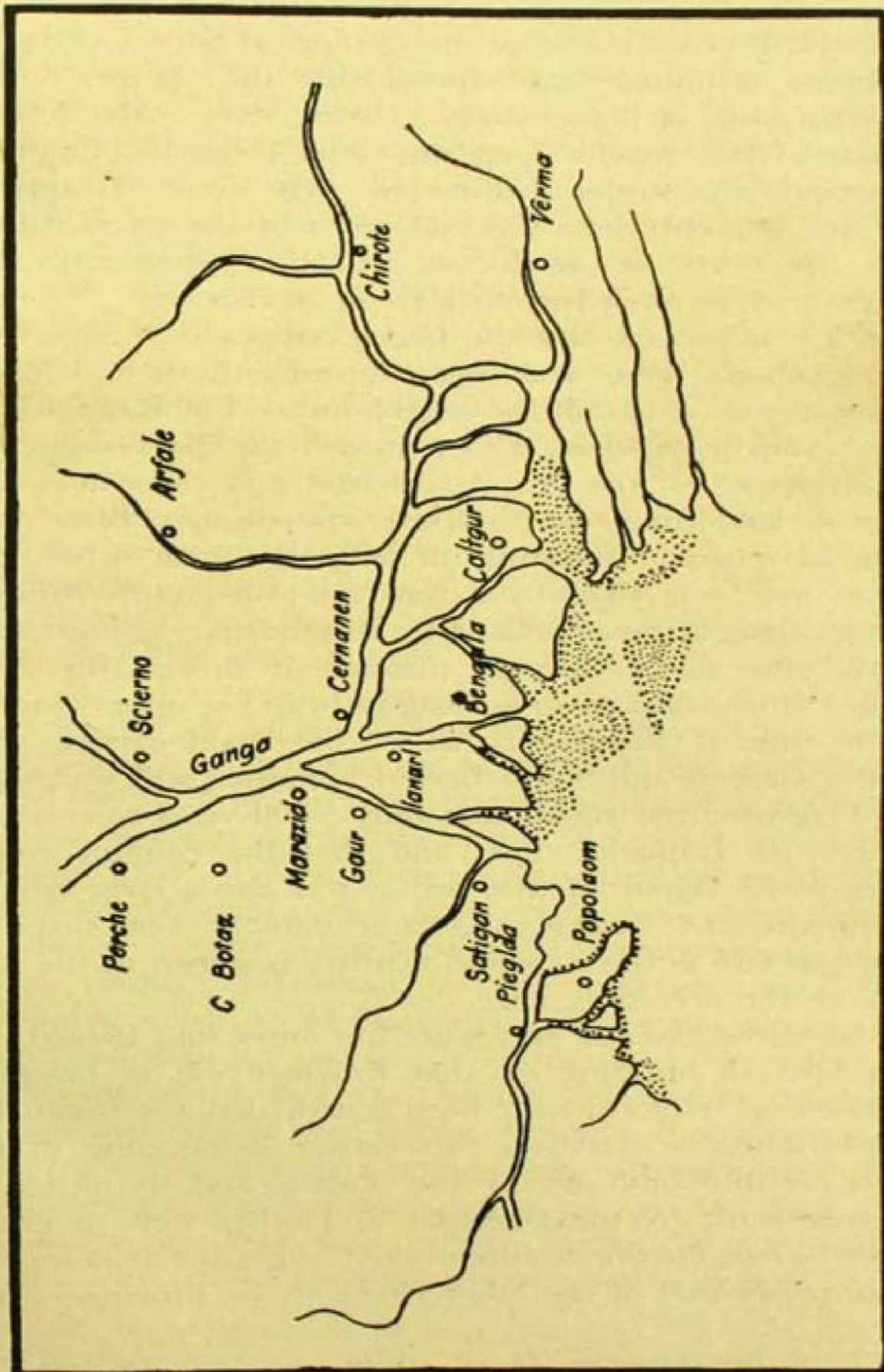


Diagram No. 2

Bengal as shown in Gastaldi's Map of Asia (1561)



by T. H. D. La Touche of the Geological Survey of India, is almost an unmistakable proof that the Ganges flowed into the basin of a previously existing river. Mr. Adams-Williams, who was for long the Chief Irrigation Engineer of Bengal, also supports this view. He says: "It appears that this (the old) delta was laid down by the rivers issuing from the north or north-east, and that presumably the Ganges had not then become a factor in that case. The old delta was depressed and the Ganges appears to have then entered on the scene and began forming the new delta on the top of the old from the neighbourhood of Rajmahal."⁴³ Thus, Addams-Williams also believes that the Ganges was not originally on the scene in Bengal and came at a considerably later time. But whatever contribution Bhagiratha might have had in diverting the original course of the river it does not seem likely that the river Bhāgirathi running through Bengal was excavated by Bhagiratha. It must have derived the name because through it flowed the river Ganges which was known as Bhāgirathi in her upper reaches. In the time of Bhagiratha, as we have said earlier, most parts of Central and South Bengal remained still under the sea. Fergusson has stated that only 5,000 years ago the sea washed the Rajmahal hills and that the country round Sylhet was a lagoon of that sea, as was also a large part of the province of Bengal at a later date.⁴⁴ The shape of Bengal as late as the sixteenth century is shown in the map given in the preceding page.

Now, the Ganges, ever since her entry into Bengal, has been busy in building up that Province. It is, however, supposed, as it has already been noted, that she began her delta-building activity on two earlier deltas, one in the north possibly built up by the Teesta, and the other on the west built by the Damodar and other western rivers. None the less, the importance of the Ganges as a delta-builder far surpasses that of the other rivers of the Province. It is

⁴³ Quoted by Majumdar, *op. cit.*, p. 40.

⁴⁴ Cf. Wadia, *op. cit.*, p. 228.

only very recently that the Brahmaputra has been a serious rival to her in this regard, and both of them are very active in their work. The combined delta of the two now measures nearly 50,000 sq. miles as compared to only 12,500 sq. miles of the Mississippi, and the delta of the two Bengal rivers is still advancing into the Bay of Bengal inspite of a strong tide.⁴⁵ The Ganges and the Brahmaputra annually carry into the Bay about 40,000,000,000 cubic feet of solid materials, which is more than 5 times as much as carried by the Mississippi.⁴⁶ The latter annually discharges an average quantity of 7,471,411,200 cubic feet into the Gulf of Mexico. According to experiments made by Everest, the Ganges alone conveys annually to the Bay, at a conservative estimate, more than 356,000,000 tons of sand and clay—an average of over 900,000 tons of silt a day.⁴⁷ Thus, the rivers of Bengal are very active in fast building up lower Bengal and also extending the southern boundary of the Province far and far into the sea.

The Brahmaputra.—Rising from a source close to that of the Ganges but lying in the hinterland, that is, the north side of the great Himalayan ranges, the Brahmaputra flows over the Tibetan Tableland almost due East from about longitude 82°E to 96°E, then takes an upward bend to the north-east and again comes down and enters Assam through the north-east corner. She then travels south-west and enters Bengal through Mymensingh District whence she flows almost due south up to Goalando. There she receives the Ganges and then the two take a south-easterly direction and proceed on to the Bay, but before falling into the latter they are met on the way by the Meghna, the third largest river of the Province, at a point north of Chandpur. This is the course of the Brahmaputra as we find it today.

But, as we have seen earlier, before 1830 she, after entering the district of Mymensingh, took a south-easterly

⁴⁵ Scott, *An Introduction to Geology*, Vol. I, p. 278.

⁴⁶ *Ibid.*, p. 267.

⁴⁷ Cf. Wadia, *op. cit.*, p. 38.



course and flowing past Mymensingh fell into the river Meghna.⁴⁸ Her present channel, Jamuna, then remained a minor stream. But when the Teesta suddenly changed her course as well as her allegiance from the Ganges to the Brahmaputra, the old channel flowing by the east of Mymensingh was unable to hold the excess water and so the river began to seek a new channel which she found in the Konai-Jhenai. Gradually she diverted her main stream through this channel, absorbing Jamuna in her lower reaches. But the entire section of the river from the northernmost point in Bengal to her confluence with the Ganges came to be known as Jamuna. Since then, however, the old stream flowing past Mymensingh has considerably deteriorated and is almost dying up. The new main channel of the Brahmaputra, that is, the Jamuna assumed a progressively increasing importance. Mr. S. C. Majumdar is of opinion that this importance of the Brahmaputra has been not only due to the fact that the Teesta shifted her course and joined with the former, but the Dihang which originally had no connection with the Tibetan river Tsanpo and was a mere minor branch of the Brahmaputra in the upper reaches became subsequently connected with the Tsanpo and brought down the water of the latter into the former. That connection has since been maintained and the Brahmaputra has been receiving the enormous water of the Tsanpo in addition to that of the Teesta. At present practically all the important rivers of North Bengal discharge their waters into the Brahmaputra and the heavy rains of the Darjeeling hills and of the Jalpaiguri and Assam Duars are drained through this river. All these have contributed in making the Brahmaputra a more powerful river than the Ganges. She now traverses a length of 1,800 miles, which is some 260 miles greater than the length of the Ganges. Her catchment area is about 361,000 sq. miles, which receives an annual average rainfall of 88 inches, whereas the Ganges has a catchment area of 350,000 sq. miles with an annual

⁴⁸ In 1785, Rennel found the Brahmaputra flowing through Sylhet.

average rainfall of only 42 inches. There is no wonder, therefore, that the Brahmaputra overflows her banks every year during the rains, and floods a vast stretch of land adjoining her course down to the Bay. This flooding, however, extends to almost all the lands of East Bengal, thereby making these lands highly fertile. Besides, it has freed Eastern Bengal from the acute problem of water-supply that to-day faces Western and Central Bengal, and has, further, made the former a far more healthier place than the latter two regions of the Province. But a sudden and violent uprising of the Brahmaputra, as a result of heavy rains in her catchment basin lying in one of the wettest regions of India, often causes high rise of water level throughout her spill areas submerging not only fields but also roads, bridges and houses and destroying the standing crops. The fate of almost the entire East Bengal and some parts of North and Central Bengal is thus most intimately bound up with this great river.

As a delta-builder the Brahmaputra is today playing a larger role than the Ganges. The latter in course of her long journey through the plains deposits a large proportion of the silt on the way. But the Brahmaputra has comparatively much less distance to cover in the plains and so brings down enormous mass of silt and sand from her vast catchment area in the Tibetan Plateau. Much of these, however, are at present deposited to fill up the depression in the Surma Valley. Even then her part as a delta-builder is very considerable. But when the depression in the Assam Valley would be filled up she will, without doubt, be one of the greatest delta-builders in the world.

Conclusion.—We have given above a brief review of the river systems of Bengal and their work as delta-builders. Bengal is a land of rivers. So, unless the rivers are studied, no study about the Province can be complete. The fate of Bengal, her prosperity and adversity, weal and woe, wealth and poverty and, in short, her very life depend on her

river systems. Hence no book dealing with the economic problems of Bengal can afford to neglect them. But this aspect has been largely overlooked so far. It is virtually during the last two or three decades that attention, both official and non official, has been given to the river problems of Bengal. It is now being realised in this country that rivers can be and need to be controlled by human efforts for human welfare. But a long study and research on the subject is necessary. Although nothing very important has as yet been done in that direction, the Government have done well in establishing a River Research Laboratory in Bengal, which, we hope, would be able to help much in solving our river problems. The Central Irrigation and Hydro-Dynamic Research Station at Poona has also been conducting researches on the river problems of India as a whole. Besides, researches on the river problems of Bengal have been undertaken at the University Science College, Calcutta, by eminent scientists including Dr. M. N. Saha, and also at the Agricultural Chemistry Section of the Dacca University. But the entire subject is still confined more or less to the exploratory stage. The study of the subject is, of course, full of difficulties. Particularly, paucity of literature is a great handicap. None the less, researches and experiments have been carried out in the United States with regard to the Mississippi with great success. It is hoped that, given the proper energy and money, we, too, can find a satisfactory solution of our riverain problems including drought, flood-control, soil-erosion, training of the unruly rivers, etc., and thereby reduce the incidental danger to life and property of the people of the Province and at the same time augment our material prosperity.

VII. SOIL

Soil is the product of the disintegration or chemical decomposition of rocks.⁴⁹ It is a residual product left by the disintegration or decay of rocks on land surfaces. Most

⁴⁹ Scott, *op. cit.*, Vol. I, p. 213.

soils have originated where they are now found. But in some cases soils have been transported and deposited far from their places of origin. Alluvial soils, that is, soils deposited by rivers, and Glacial soils, that is, soils transported by ice, are examples in point. But these soils, too, had their early origin in rock decay. The former are classed as *residual soil* and the latter *drift soil*.

Basic Structure of the Soil.—The basic structure of the soil is, therefore, constituted of sand, gravel and mud formed by the disintegration or decomposition of rocks. Various forces of nature, such as, air, warmth and moisture, have been constantly acting upon rocks from the primeval times, and are breaking them into smaller and smaller stones, pebbles, gravels and finally into sand and clay. Air and moisture wear out and loosen the hard rock-surfaces by the processes of oxidation and hydration. Iron, for example, which is an important element in rocks, by coming into contact with air is oxidised and the stones get rusty and become loose. In that condition the rocks cannot hold on for long and are either washed away by rains gradually as they wear down or, in absence of rain, fall to pieces after having worn out for long. Similar is the case with other elements the stones are constituted of. Thus, Nature is acting constantly, either chemically or mechanically, on the rocks breaking and dissolving them into finer and finer parts and also separating their constituent elements.

Rain performs a great mechanical work and carries the loose soil down from higher to lower levels. This is technically known as the "rain-wash". The rapidity with which the rain washes down the soil, depends upon the steepness of slopes since the force of gravity is at work. But "the mechanical wash of rain is greatly retarded by a covering of dense vegetation, especially of grass, stems, and roots, which form an elastic mat that protects the soil against the impact of rain-drops and the wash of rain-hills. The contrast between a dirt road and the adjoining grass fields



after a torrential shower is often very striking. The road is torn and gullied to the depth of several feet, and the fields are quite unaffected". Indeed, any one who has been to any part of the extensive tract of the Himalayan foothills will have wide experience of this.⁵⁰ After every shower the water runs in torrents down the narrow roads tearing and opening the latter as much as making them impossible for use, while the covered lands just by their sides remains very little affected. This process has been going on for thousands of years with the result that hundreds and thousands of gullies and cracks have been inflicted on the southern slope of the great Himalayan ranges, and through them run down in the rainy season violent streams roaring and rumbling and resounding the entire mountainous region. But "even in countries well covered with vegetation, the streams which are ordinarily clear become turbid and muddy after heavy rains, because of the soil which the rains and rivers that flow through alluvial valleys or plains, like the Missouri and the Mississippi, are always scouring".⁵¹ It has been estimated that as a result of scouring the Mississippi is lowering the surface of its whole basin by one foot in 4,920 years. The Ganges, however, is planing down her own basin more than twice as fast—one foot in 1,880 years. The main reason of this difference is the exceptionally heavy precipitation of rain in the basin of the latter.⁵²

Thus, "transportation by rivers is the most important of their geological activities, for they carry away the debris furnished by their own activity and that of the atmosphere. No other of the surface agents is so efficient in transporting to the sea the waste of the land as is the river. The transportation is of two kinds of material, that which is in solution and that which is in larger and small pieces, grains, and particles. The solid material is, in part, pushed along

⁵⁰ A long stay by the author in the Baksa-Duar which rises 2,600 feet above the sea level and is situated in one of the雨iest places in the world, the annual average rainfall of the locality being more than 200 inches, has brought home to him the vivid truth of this statement.

⁵¹ Scott, *op. cit.*, p. 215.

⁵² *Ibid.*, p. 279.

the bottom by the current, which is unable to lift it and, in part, carried in suspension". The transporting capacity of running water varies as the sixth power of its velocity. It means that if the speed of the river be doubled, it can carry along 64 times as much sediment as before.⁵³ The formula refers more particularly to the coarser and heavier materials which are pushed along the bottom. The finer particles remain suspended for an indefinite period even in still water. It follows, therefore, that deposits by the rivers depend upon their speed. A slow-moving river will deposit its suspended particles in enormous quantity in its bed and in its spill area, while a fast-moving river will carry most of its deposits to the sea. The materials in suspension are largely the product of the work of the atmospheric destruction on rocks. The destruction by rains, though considerable, is much less as compared to the destruction by atmosphere. The materials in solution in the river water are generally salt, soda, borax, alum, calcium carbonate and sulphate, and various alkaline compounds. All of them, when deposited or absorbed, provide the soil with its most important ingredients, and enhances its productive capacity.

The fluvial deposits are now considered to be the most important of all deposits. But in "pluvial" climates, that is, those of large rainfall, a distinct demarcation is found between the *top-soil* and *sub-soil*. "Save in sandy areas, the topsoil is dark coloured, due partly to the admixture of vegetable mould, partly to the complete exidation and hydration of its minerals, and is unstratified. Next follows subsoil, which, owing to the absence of vegetable matter and to less complete oxidation and hydration, is of a lighter colour and often shows stratification, if derived from a sedimentary rock." Again, "topsoil and subsoil have been traversed innumerable times by descending rain-water, and soluble constituents have, to a large extent, been leached out of them, but, happily, the soil has the unexplained property of retaining the soluble compounds of potash,

⁵³ *Ibid.*, p. 264.

phosphoric acid, and other substances essential to plant life, though even of these some part is leached out. In arid regions, where rain plays a much smaller part in the production of soil, there is no distinct demarcation between topsoil and subsoil. The leaching has been much less effective than in moist regions, and nearly all the plant-food has been retained. This explains the incredible fertility of desert soils when irrigated".²⁴ The leaching of the valuable properties of the soil as a result of flood is one of the reasons why cultivated land should periodically be supplied with artificial fertilizers.

Relation of Soils to Rocks.—It is, thus, seen that the basic structure of soil is made of sand, gravel and pebbles from disintegrated or decayed rocks. It is evident, therefore, that the character of the soil is largely determined by the nature of the rocks which provide its basic structure. So a knowledge of the soil is impossible without a knowledge of the rocks which the soil is primarily composed of. On the other hand, one knowing the nature of the rocks can at once say what would be the nature of the soil. Now, rocks are nothing but materials making up the crust of the earth. They can be classified, according to the process of their formation, into three main groups noted below.

(1) *Igneous Rocks.*—Igneous rocks literally mean "fiery rocks", and are the products of the inner heat of the earth. They are solidified from a molten state by cooling. Such rocks are generally of two classes. First, there are Volcanic rocks which were ejected in molten state from the interior of the earth in volcanic masses and covered a part of land surface, and subsequently solidified at or very near the surface. The rocks in the Deccan Trap have been formed in this way. But generally the molten rocks solidify underground and sometimes fill the cavity of other rocks. They are then called Plutonic rocks. It is only when as a result of denudation the outer cover is removed that these

²⁴ *Ibid.*, p. 214.

igneous rocks are found. The granite is a good example of these rocks. Such rocks are generally hard and resist atmospheric action. The igneous rocks are primary rocks as all other rocks have been derived from them, either directly or indirectly.

(2) *Sedimentary or Stratified Rocks*.—These rocks were laid down generally under water, but in some cases on land also, in successive horizontal beds or strata by running water or sea or lake or by wind. The largest part of sedimentary class is, however, formed of those which were accumulated under water and especially under the sea. The materials which these rocks are made of were derived from the disintegration or chemical decomposition of older rocks. Sometimes shells of animals and plants are found lying in these rocks in deep interior. These had been buried long before under the sea, and hardened in course of time. When these solidified sediments are raised by earthquakes they form hard rocks. The remains of animals found in rocks are known as 'fossils'. The shells and tests of animals and plants thus raised from the bed of the sea form an important group of rocks called the Limestone. They are also known as Organic Rocks. But the more abundant sedimentary rocks are shales and sandstones which are made up of the materials of older rocks. Sedimentary rocks are, again, divided into three groups: (i) Alluvium which are still being formed by rivers; (ii) Young soft rocks; and (iii) Old hard rocks raised into high mountains as the result of earthquakes. Sedimentary rocks are also called secondary or derivative rocks as their materials were supplied by earlier existing rocks.

(3) *Metamorphic Rocks*.—These are rocks which, literally meaning, have changed their forms. In fact, "sedimentary or igneous rocks which have been more or less reconstructed *in place*, without decomposition or disintegration, but with an increase of hardness", become the metamorphic or crystalline rocks. This transformation takes an unusually long time and is considered to be caused

by heat. Crystalline rocks, like igneous rocks, are so much hard and unamenable to the forces of Nature that they have been found to remain unchanged ever since their formation. The Deccan Plateau in India is a good example of this class of rocks.

Rock-forming Elements.—To understand the character and properties of the soil it is not only necessary to know the rocks it is made of, but, in the ultimate analysis, a knowledge of the elements that go to constitute those rocks is essential. Now, as calculated by Clarke and Washington, 98 per cent of the earth's crust, including the ocean and atmosphere, are made up of the following eight elements in proportions noted against each.

1. Oxygen (O) ...	46.68	5. Calcium (Ca) ...	3.63
2. Silicon (Si) ...	27.60	6. Sodium (Na) ...	2.72
3. Aluminium (Al) ...	8.05	7. Potassium (K) ...	2.56
4. Iron (Fe) ...	5.03	8. Magnesium (Mg) ...	2.07

And, 1.55 per cent of the earth's crust is composed of other eight elements noted below:

Titanium (Ti)	Manganese (Mn)
Phosphorus (P)	Sulphur (S)
Carbon (C)	Chlorine (Cl)
Hydrogen (H)	Barium (Ba)

Thus, 99.89 per cent of the known crust of the earth is made up of only 16 elements, and the remaining percentage, that is, a little over one-tenth of one per cent., is composed of all other elements including important metals, such as, copper, lead, zinc, tin, silver and gold. Out of 16 elements named above, excepting gases, only two, carbon and sulphur, exist in Nature uncompounded. All the rest occur in compounds formed by the union of two or more of them.⁵⁵

Humus.—The chief difference between the composition of the Igneous and Sedimentary rocks is that the latter

⁵⁵ *Ibid.*, p. 21.

contain, while the former do not, organic matters formed out of deposits of the remains of animals and plants that formerly moved and grew under the sea. That is why oil and coal which are made up of the remains of animals and plants are always found in sedimentary rocks. Coal is found only in sedimentary rocks. But apart from the localisation or concentration of the organic remains in sedimentary rocks giving rise to oil and coal, the organic matters are also found mixed up with the entire mass of materials that compose the sedimentary rocks. Necessarily, the soil that has been formed out of sedimentary rocks must contain organic substances. And, as organic substances are very vital for the growth of plants, this soil is generally more fertile than that formed out of igneous rocks. The organic substances are called "humus" which forms an essential ingredient of soil. The humus, in the form of decomposed bodies of plants and animals in more or less quantities, is being continuously added to the soil and is thus helping the latter to maintain its fertility. "Soil fertility has been supposed to depend largely on the amount of soluble humus present in the soil; and apart from being a source of plant-food, its presence in the soil-constituents greatly modifies the physical properties of the soil by increasing its water-holding capacity, thus imparting conditions of good tilth and aeration."³⁶ The importance of applying green manures and bone-dust to arable lands lies in the fact that they add to the humus in the soil and enable the latter to maintain its productive capacity.

Necessity of Chemical Fertilizers.—The chief elements that are necessary for producing most plants are Nitrogen, Potash and Phosphoric Acid. But from our above analysis of the rock-forming substances we find that these are the three elements which are found in the earth's crust only in very small quantities. Maercker, a great authority in

³⁶ Article on 'Agricultural Research and Practice in Europe' by N. N. Ganguly, published in *The Journal of the Department of Science* (Cal. Univ.), Vol. VI.

Europe on Agricultural matters, gives an analysis of the surface soil. He grades this soil into different qualities according to the quantities of Nitrogen, Potash and Phosphoric Acid contained in every 10,000 pounds of surface-soil (*i.e.*, the soil up to the first six inches). Thus,

Table No. 3. Maercker's Classification of Surface-Soil⁵⁷

Grade	Nitrogen (lbs.)	Potash (lbs.)	Phos. Acid (lbs.)
Rich	Over 40	Over 25	Over 25
Good	25—40	15—25	15—25
Normal	15—25	10—15	10—15
Tolerable	5—15	5—10	5—10
Poor	...	5	5

Judged by these standards defining the different qualities of soil, a good quality soil is relatively scarce. The soil of the Indo-Gangetic plain is considered as one of the most fertile regions of the earth. Yet even there, out of 12 kinds of typical soils of the plain, only 2 belong to the normal class and 7 to the poor. 3 would just come under tolerable as regards Nitrogen. Phosphoric Acid is normal in 2, tolerable in 4 and poor in 6. Only Potash is abundantly rich in nearly all, but how much of it can be dissolved and absorbed by the plants as food is not certain.⁵⁸ And, if this is the condition of a soil that is well-known for its fertility, that of relatively poorer soils must indeed be worse, that is, they would contain far less amounts of the three essential plant foods. This brings in the necessity of adding various fertilizers to the soils in order that the different constituents serving as plant foods can either be restored where there has been a depletion or enhanced where there is a deficiency. These fertilizers may be natural like dung and urine of cattle, green manure, etc., or artificial like various chemical fertilizers.

⁵⁷ Quoted by J. Kenny, *Intensive Farming in India* (1916), p. 83.

⁵⁸ *Ibid.*

OUR SOIL

Now that we have given a brief analysis of the constituents of the soil in general we will proceed to discuss the character of our own soil. Indian soil is generally classified under four main heads: (1) the Alluvium, (2) the Regur or Black Cotton Soils, (3) the Red Soils of Madras, and (4) the Laterite.

(1) *Alluvium*.—The Alluvium is agriculturally the most important of all the four. It covers the entire Indo-Gangetic Plain, the depression lying in between the Himalayas on the north and the Deccan Plateau on the south, and extends from the Punjab and Sind in the west to Bengal and Assam on the east. The huge mass of materials that have been brought down for ages by the great rivers of the north, the Indus, the Ganges, and the Brahmaputra, have mostly built up the Indo-Gangetic Alluvial Plain which is made of such fine particles that scarcely a piece of stone is found within miles and miles of territory. The area of the Indo-Gangetic Plain is about 300,000 square miles and its width varies from 300 miles in the west to less than 90 miles in the east. The Alluvium has been found to extend to a depth of more than 1,000 feet below the ground surface. But the maximum thickness is yet to be ascertained. Apart from the alluvial soils of northern India, there are other alluvial plains in India which have been built up by rivers like the Mahanadi, the Tapti, the Godavari and the Kistna, all in South India. The alluvial soils generally contain adequate Potash but insufficient amounts of Nitrogen and organic matter. Phosphoric Acid is, however, generally less deficient than in other Indian soils, and there is extraordinary variations in lime content.⁵²

(2) *Regur*.—The Regur or black cotton soil is found in practically the whole of the Deccan Trap which covers greater portions of the Bombay Presidency, the whole of Berar and the western parts of the Central Provinces and

⁵² Report of the Royal Commission on Agriculture, p. 73.

Hyderabad, as also in certain districts of Madras. The soil is not rich in humus as the dark colour would indicate. The colour is possibly due to the weathering of some mineral substances present in the great sheets of lava which this region is constituted of. Indeed, the darkness of colour is thought to be caused by the presence of a large proportion of iron in the finest soil particles.⁶⁰ This soil is especially suitable for growing cotton and the region forms the greatest cotton growing tract of India. But the different soils forming this class are found to vary to an extraordinary extent, both in character and productivity. The *regur* soils are, however, generally deficient in Phosphoric Acid and Nitrogen, but contain sufficient Potash and lime.

(3) *Red Soil of Madras*.—The red soils are found in almost the whole of Madras, Mysore, the south-east of Bombay Presidency, the eastern half of Hyderabad, the centre and east of the Central Provinces, Orissa, Chota Nagpur and the south-west of Bengal. The soil of these parts has been formed by the decomposition of crystalline and gneissic rocks of the archian system, which are allied to granite. The 'red' soils, too, widely vary in consistency, depth and fertility. The reddish-brown loams and yellow clays of the lower levels are fertile, but the thin gravelly and light coloured soils of the uplands are generally unproductive. Red soils are, as a rule, deficient in Nitrogen, Phosphoric Acid and humus, but contain Potash and lime in sufficiency.

(4) *Laterite*.—Laterite soil is formed by the gradual accumulations of the decomposition or disintegration of old

⁶⁰ Cf. Wadia, *op. cit.*, pp. 221, 305. "Much of the well-known 'cotton-soil', known as the 'black-soil', or *regur*, is due to the subaerial weathering of basalts *in situ*, and a subsequent admixture of the weathered products with iron and organic matter".

Also pp. 304-5. "Regur is a highly argillaceous, somewhat calcareous, very fine-grained black soil. It is extremely sticky when wetted and has a capacity for retaining a large proportion of its moisture for a long time. Among its accessory constituents are a high percentage of iron oxide, calcium and magnesium carbonates . . . and a very varying admixture of organic matter, humus, ranging from one to as much as 10 per cent."

rocks through the actions of atmosphere. It is formed only in tropical countries where there is a plenty of rain. It is of red colour due to the oxidation of iron present in the soil. It is, thus, "a tropical soil, characterised by the presence of a large proportion of aluminium oxide, and of a deep red colour from the haematite, which form lumps and nodules as well as colouring the whole. The soil is subject to a slow creep down from the hillsides into the valleys and from these into streams which eventually carry it into the sea."⁶¹ The laterite, however, is composed of little clay and much gravel of red sandstone rocks and is generally very poor in fertility.⁶² This soil is heavily deficient in phosphoric acid, potash and lime, all of which are indispensable for plant growth. But humus is present in larger quantities than is found in most other Indian soils. Laterite soil is found as a cap on the summits of the basaltic plateaus of Central India and along the Eastern and Western Ghats, and also in Assam and Burma. The ferruginous clays of the Nilgiris and other planting districts of South India, Bengal and Assam are also placed in this category.⁶³ The great peculiarity of the laterite soils is almost the total absence of lime and magnesium, which gives their marked acidic reaction. The correction or amelioration of this acidity is one of the main agricultural problems of these soils. There are, however, divergent types of laterite soil. Laterite soils found on higher levels are exceedingly thin and gravelly with little power to retain moisture and, hence, these are of little value to agriculture. But those found on the lower levels and valleys are dark-coloured heavy loams and clays that readily retain moisture and are capable of producing quite good crops. The former are known as high-level laterite and the latter as the low-level laterite.⁶⁴

⁶¹ Scott, *op. cit.*, Vol. I, p. 231.

⁶² Kenny, *op. cit.*, p. 83.

⁶³ Cf. *Agricultural Commission Report*, pp. 74-5.

⁶⁴ For greater details regarding Laterite see Wadia, *op. cit.*, Ch. XXIII.



The above are the four main classifications of Indian soil. Through the activities of men for thousands of years the "original and indestructible" properties of the soil are, however, hardly to be found to-day. Most soils have undergone great changes through cultivation for ages. None the less, the basic characters of the Indian soil are of four kinds noted above.

BENGAL SOIL.

The soil of almost the whole of Bengal is of alluvial origin. Excepting certain portions of the districts of Birbhum, Bankura, Burdwan and Midnapore on the west, of Jalpaiguri and Darjeeling in the north, and Chittagong in the east, the soil of all other places is alluvial in character. The alluvial soil is, however, of two kinds—old and new.

Soil of the Old Delta.—We have already pointed out that before the entry of the Ganges into Bengal there were in all probability two older deltas in the Province—one in the north and the other in the south-west—the traces of which are still found in places in a stratum of yellow clay underlying the upper and newer strata of blue clay and sand. The present elevated lands of the Madhupur Jungle area, which extends from the north-west of Mymensingh district up to Manikganj in Dacca district, and of Barind area in North Bengal are said to be the remnants of the old delta of the north. As a matter of fact, the yellow clay of the Madhupur Jungle highlands is quite different from the blackish sandy clay that is found on the borders of the old Brahmaputra flowing past Mymensingh as well as on those of the Jamuna or the new Brahmaputra.⁶² The yellow clay is very similar to that found in the districts of Rajshahi and Malda which are included in the tract known as old

⁶² An extensive travel by the author himself in the west Mymensingh made this evident to him.

Agricultural Economics of Bengal

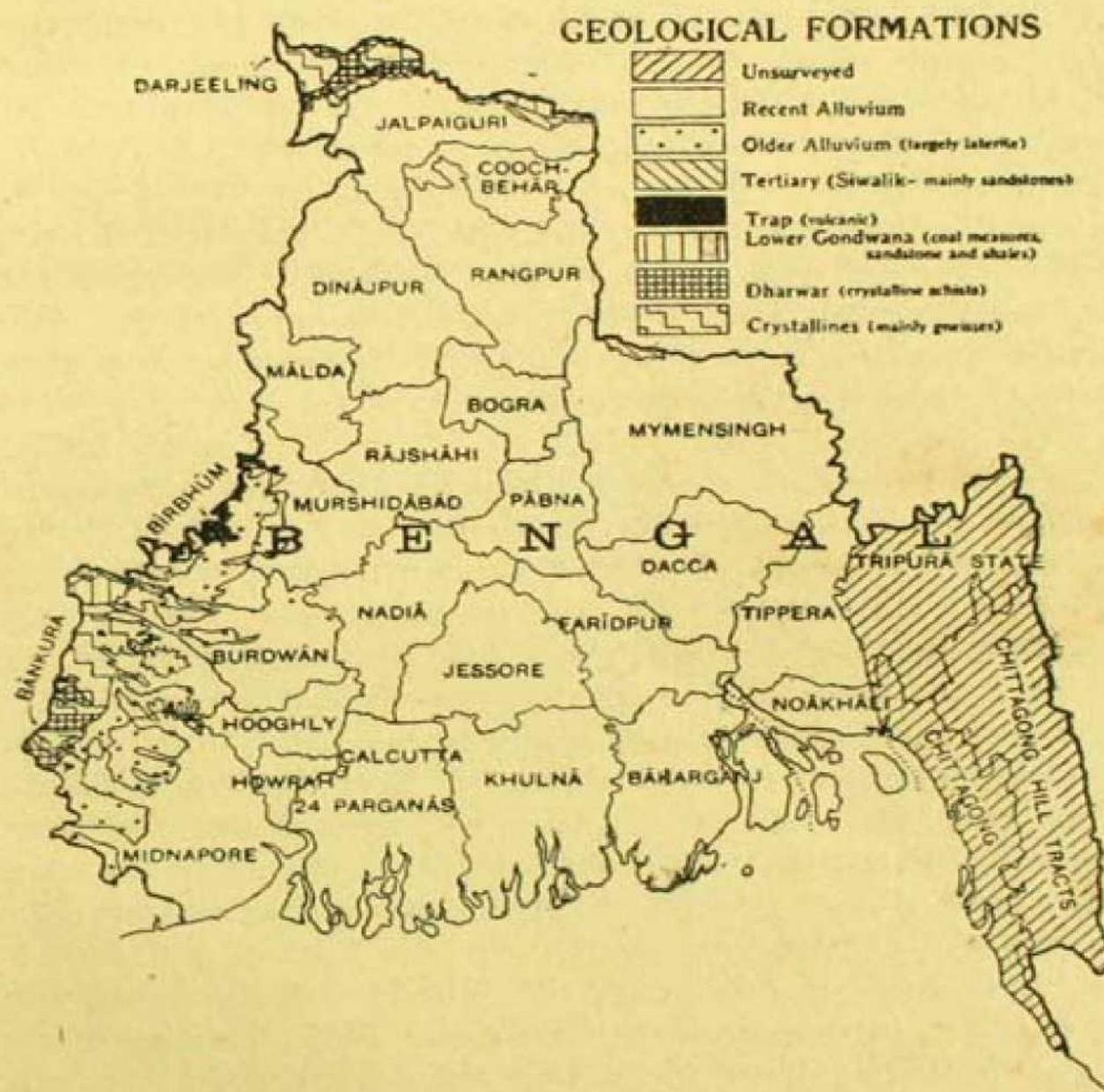


Diagram No. 3

Geological Map of Bengal

[From the *Census Report of India, 1931, Vol. V, Part I.*]



Barendrabhumi. This indicates that the two once formed part of the same delta.

The characteristics of the soil of the old delta are that, apart from its yellowish colour, it is clayey and sticky, and does not easily absorb water. This soil belongs to the class of Clayey Loam, that is, it contains 70 to 85 per cent. clay and the rest sand. Such a land is hard to work. Because of the presence of a high percentage of clay it becomes hard like stone when dry and gets slippery when wet. It contains very little humus. Lime and phosphate are also scarce in it, but it contains much Potash which is a very useful plant food. The soil is of highly acidic character. No cereal can be raised on this land if there is no arrangement for sufficiently watering it in the dry season. Generally, autumnal crops are raised on it during the rainy season.

Soil of the New Delta.—The new alluvium forms more than 90 per cent of the soil of Bengal and is constituted of the alluvial deposits of all the existing rivers including the Damodar, the Bhagirathi, the Ganges, the Padma, the Brahmaputra and the Meghna. The natural fertility of soil of the Province is due to the richness of this new alluvium. It is very light and contains much humus and moisture, the two most essential things for plants. Both Rabi and Kharif crops can be produced on this soil throughout the year. Generally it requires little artificial watering since the rain-water and the spill-water of rivers are quite sufficient for purposes of cultivation.

It should not, however, be considered that this new alluvium is of one uniform character. The fertility of the alluvium varies with the rivers that carry them, that is, ultimately with the character and composition of the rocks from which the different rivers originate. The alluvium of the Bhagirathi and the Padma (that is, the combined stream of the Ganges and the Brahmaputra) is the most fertile of all. The reasons are: first, they have their catchment areas in a comparatively recent class of rocks,

that is, sedimentary rocks which the Himalayas are made of, and, as these rocks contain numerous mineral substances, the latter are carried down by the two mighty streams and deposited along with sand and silt, and thus add to the fertility of the alluvium. Secondly, as the vast catchment areas of these great rivers are covered with dense forests, their streams always carry enormous organic matter in the forms of putrid and decomposed bodies of plants and animals, which increase the proportion of the much valued humus in the silt carried by them. But the alluvium of the West Bengal rivers can never be as fertile as that of the Ganges and the Brahmaputra since the former carry the silt taken out of much older rocks which have been washed away for a considerably longer period than the Himalayas and have, as a consequence, lost much of their valuable properties. Moreover, as the catchment areas of all the West Bengal rivers together amount to only 25,000 square miles as compared to nearly 711,000 square miles of the Ganges and the Brahmaputra, and are considerably denuded of vegetation, the silt carried by them contains relatively little humus. As regards the alluvium of the Meghna, since the latter has a comparatively little catchment area and much of the silt carried by it is at present deposited in the Sylhet Jheel, its alluvium up to its entrance into the Padma cannot be as fertile as that of the Ganges-Brahmaputra.

The newest alluvium is, however, to be found in South Bengal, in the area of the Sunderbans and in the south of Noakhali and Chittagong districts. Here the lands lying above the salt water limit are highly fertile. Generally *Aman* paddy is grown on these lands. The whole of the Sunderbans area is especially noted for its paddy.

Soil of West Bengal.—The soils of the districts of Murshidabad, Birbhum, Burdwan and Midnapore can be distinctly classified into two kinds. The eastern halves of all these districts are of deltaic character and the soils there are the products of alluvial deposits of the rivers flowing



down from the hills of Santhal Parganas and Chota Nagpur Plateau. These rivers include (1) the More, locally known as Mayurakshi, flowing past western Murshidabad and Birbhum; (2) the Ajay, between Birbhum and Burdwan; (3) the Damodar, between Burdwan and Bankura; (4) the Cossye or Kangsavati flowing south of Midnapore town, which assumes the name of Haldi in the lower reaches and at its point of confluence with the Hooghly; (5) the Rupnarain, the biggest of the West Bengal rivers, flowing into the Hooghly by the east of Midnapore district; and the Suvarnarekha flowing south-west of Midnapore and demarcating in the lowest reaches the boundary between Bengal and Orissa. As a result of the delta-building activities of these rivers the soils of the eastern halves of the districts named above are generally very fertile.

But the soils of the western halves of all the districts and of almost the whole of Bankura bear great resemblance to the red hard granular soils of the Chota Nagpur Plateau. Really this part of Bengal is a continuation of that Plateau which gradually slopes down from the west to east. This becomes even visible to any body travelling by the different railways that leave the Province and enter the Santhal Parganas and the Chota Nagpur Plateau. The soil of these places admits of very little vegetation although some parts are covered with dense *Sal* forests. In wide areas, however, not even grasses are found to grow during the rainy season, not to speak of other seasons. Some lands are, of course, cultivated in the wet season and only one crop, *viz.*, the winter paddy, is raised. But the yield per acre is very low.

It is probable, however, that if suitable arrangements are made for irrigating these lands, which form not an inconsiderable part of the total land of Bengal, they can be made to yield much more benefit than they do now. It may be pointed out that different crops require different soils. When the pressure of population is high no yard of land should be left unexploited. With the development of artificial irrigation and the agricultural chemistry all available

lands can be brought under cultivation. In the United States, the sandy deserts of the west, which were at one time thought to be absolutely useless, are to-day converted into highly profitable lands with the help of science and human energy. They are now producing excellent oranges and pine-apples, and the finest grades of tobacco, all the three being exported throughout the world. So, we need not despair at the soil of Western Bengal. Even the gravelly soil which has larger particles of sand than sandy soil, though poor, can be treated in the same way, and though it may require heavy manuring, it can be made useful for a number of crops.^{**} As a matter of fact, the red hard soil of Midnapore has been found especially suitable for growing long-stapled cotton which is a very valuable and at the same time useful crop. The entire west of West Bengal, having this red hard soil, can be converted into a highly profitable cotton and wheat-growing tract.

The hilly tracts of Chittagong and Tippera districts can be also used for raising dry crops. They, too, are especially suitable for producing cotton and wheat.

The Terai lands of the districts of Darjeeling and Jalpaiguri are at present mainly used for tea plantations. During the author's extensive tours in these regions the unusual fertility of these lands was clearly marked. Indeed, it cannot be otherwise. The soil of these regions supply the great rivers of Bengal with a considerable part of the silt carried by them, and a thin layer of that silt is considered sufficiently valuable. So, that the entire soil of the Terai regions should be much more valuable than the silt can easily be understood. The growth of vegetables and flower gardens in the Himalayan foot-hills is unusually remarkable. But this extensive soil in the Terai of Bengal is at present not being much utilised. In Jalpaiguri district tea-gardens are still confined mostly to the plains. The slopes of hills have remained largely

^{**} Keny, *op. cit.*, p. 79.



unexploited. In Darjeeling district some hill slopes have been brought under tea-plantation and other cultivation. But still much remain unused. Although oranges form an important crop of the terai lands of these two districts, their cultivation takes only a small portion of the total available land. More terai lands can be brought under valuable crops. There is, however, the danger of denudation which must be guarded against. Fodder crops, it seems, can be produced extensively in these lands. They will supply the much needed food for our cattle, which is no less important than our food or cash crops, and at the same time will provide with their stumps the necessary cover against rain.

CLASSES OF SOIL.

Before we conclude this chapter we would point out the different classes of soil chiefly found in this Province and the crops that are especially suited for each class. Thus,

1. *Sandy Soil*.—Where the soil contains no clay at all or contains clay only up to 10 per cent. and the rest sand, it is known as sandy soil. Valuable fruits and vegetables can be raised on this soil. In the United States, almost pure sandy lands are used for raising potatoes, oranges and pine-apples, and also finest grades of tobacco.

2. *Sandy Loam*.—When 10 to 40 per cent. of the soil contains clay and the rest sand, it is called Sandy Loam. It is a good open soil and can be easily worked. The crops usually suited to this class of soil are potato, tomato, jute, paddy, jowar, millet, barley, wheat, sugarcane, maize, groundnut, gram, pea, *Khesari*, *mung*, turmeric, plantain, ginger, etc.

3. *Loam*.—A soil containing 40 to 70 per cent. of clay and the rest sand is called Loamy soil. It is an excellent mixture and is very fertile. Generally *Aus* paddy, millet, barley, bajra, *til*, mustard, sesamum, groundnuts and leguminous crops are best raised on this soil.

4. *Clayey Loam*.—It contains 70 to 85 per cent. clay and the rest sand. It has much potash which is very useful for growing plants, but is hard to work. This is the soil on which are best grown the *Aman* paddy, jute, wheat, millet, etc.

5. *Heavy Clay*.—A soil containing 85 to 95 per cent. clay and only 15 to 5 per cent. sand is known as heavy clay. It is very hard to work. It requires deep ploughing and a good drainage to raise good crops.

6. *Limy Clay*.—A soil where the proportion of lime is very great, is known as Limy Clay. It is best suited for paddy, *arhar*, wheat, jowar, *khesari*, gram, etc.

It may be mentioned, however, that the nature of crops to be raised does not depend merely on the character of the soil. The atmospheric forces like air, sun-light and, above all, rainfall, have much to do in the matter. A land, for example, otherwise suitable for growing *Aman* paddy cannot do so unless it gets sufficient rainfall or at least irrigated water.

Results of Experiments on Bengal Soil.—Soil in every country is an interesting field for research and study. Apart from its 'light-bearing' interest, it has a great 'fruit-bearing' interest too. Indeed, the very *sine qua non* of a scientific planning of agriculture is an exhaustive and systematic study of the character of the soil, of its deficiencies and possible treatments, and its suitability for growing different crops. It is, indeed, a matter of great regret that a thorough survey of soil conditions is yet to be achieved in this country. The Royal Commission on Agriculture expressed the view that, if the necessary personnel and funds were available, a soil-survey would be desirable with the view of classifying and mapping the different soils of India by modern methods.⁶⁷ The Commission, however, were not in favour of an immediate soil-survey of the whole of India on the lines of survey carried out in the United States of America

⁶⁷ A. C. Report, Para 76.

as it would be a gigantic enterprise, although they suggested for reconsidering the position at a later period when scientific knowledge was more widely diffused and competent workers could be trained in India. So, up to this time no exhaustive soil-survey, either on a country-wide scale or even in a single province, has been carried out.

The Agricultural Departments in the provinces were, however, advised by the Commission to undertake examination of soils when there was some specific problem to be solved, or when laboratory experiments of soils was called for to interpret more fully valuable information already placed on record by the Settlement Department of each province. As a matter of fact, such examination of soils was already being carried out in some provinces for the purposes of assessing the land revenue. But after the reorganisation of the agricultural departments in the provinces in 1905 the agricultural chemists appointed undertook, as their first task, the study of local soil types and conditions, which was an essential preliminary to the initiation of research into local problems. Much of the work following from these studies have proved to be of interest and importance to India as a whole. The cumulative results of such studies in different provinces have established a few cardinal facts regarding Indian soils in general, which are, first, that they are generally seriously deficient in plant-food materials; secondly, very considerable loss of nitrates takes place by drainage during periods of heavy rainfall; thirdly, humus content is low due primarily to the very rapid decomposition of the organic matter in the soil, which occurs in tropical and sub-tropical conditions and which makes it difficult to maintain a sufficiently high proportion of humus; fourthly, the laterite soils are deficient in lime and are consequently of acidic character; certain laterite soils are deficient in potash also.

The cardinal facts, as stated above regarding Indian soils in general, are applicable to those of Bengal as well. We may note here, the results of experiments carried out

recently in different Government Farms in Bengal on soils and also on the Ganges Silt. Thus,

- (1) The soil taken from the Manikpal Farm at Lalgarh in the district of Midnapore, has proved to be especially poor in nitrogen and organic matter; but potash, lime and phosphate are present in moderate amounts. Physically, the soil is a light sandy loam with a freely drained sub-soil.⁶⁸
- (2) The soil of the proposed site at Chittagong is poor in organic matter. Potash is, however, present in moderate amount, but lime and phosphate are on the low side. Physically, the soil is of a loamy nature.

The results of the chemical analysis of the soils of different farms are given in the following table:—

TABLE NO. 4. Results of Chemical Analysis of certain Soils in Bengal⁶⁹

	Manikpal, Lalgarh, Midnapore		Chittagong-Pahartoli proposed farm site		Sunti Low (Dacca Farm) ^a	
	0"-6"	6"-12"	0"-6"	6"-12"	0"-6"	6"-12"
Loss on ignition	2.49	3.12	2.87	2.77	2.04	2.86
Insoluble residue	84.45	80.33	86.81	84.22	90.87	86.19
K ₂ O	0.70	0.91	0.73	0.86	0.26	0.38
CaO	0.71	0.75	0.33	0.35	0.18	0.13
MgO	0.59	0.81	0.68	0.80	0.18	0.18
Al ₂ O ₃	6.23	8.04	5.19	6.39	4.08	6.58
Fe ₂ O ₃	4.38	5.50	2.92	3.75	1.55	2.66
Mn ₂ O ₃	0.05	0.05	0.15	0.15	0.01	0.01
P ₂ O ₅	0.051	0.059	0.035	0.026	0.036	0.025
Nitrogen	0.036	0.034	0.079	0.056	0.060	0.056

* Here the results were obtained on a manuriated experimental plots which was treated with bone every second year and with lime every year.

^a Annual Report of the Department of Agriculture, Bengal, for 1939-40 Part II, pp. 113-4.

^b Compiled from the Appendices II and IV to the Report of the Agricultural Chemist, published in the Annual Report of the Dept. of Agriculture, Bengal, for 1939-40.

The results of mechanical analysis may also be seen side by side:—

TABLE No. 5. Results of Mechanical Analysis of certain Soils in Bengal⁷⁰

	Manikpal, Lalgarh, Midnapore		Chittagong-Pahartoli proposed farm site		Sunti Low (Dacca Farm)	
	0"-6"	6"-12"	0"-6"	6"-12"	0"-6"	6"-12"
Moisture	2.06	3.10	3.19	2.84	4.70	5.86
Coarse Sand	0.82	0.63	0.85	2.39	3.59	3.94
Fine Sand	64.32	55.86	39.70	33.78	43.92	34.92
Silt	13.90	18.90	39.00	39.75	31.25	30.75
Clay	18.50	21.25	13.25	17.00	15.75	25.25
	0.42	0.44	0.36	0.34	0.45	0.25

So it will be noted from the chemical analysis that the soils of all the three farms located in widely separate places in the Provinces, are deficient in nitrogen. Potash is present in the first two farm-soils in moderate amounts, but is on the low side in the third. Lime is present in the first in moderate amount, but is much less in the other two, being the lowest in the third. Phosphate contents of the soils of the last two farms are also less than that of the first. Other compounds are present in varying proportions. The mechanical analysis, on the other hand, distinguishes the soil in the Dacca farm site from those of the other two by the presence of a greater proportion of silt and of less of sand.

Evaluation of the Silt present in the water of the Padma.—As for the examination of the silt carried down by the rivers in Bengal, only a beginning has been made. This silt has the property of having high manurial value. But the amount and the quality vary in different rivers at different times. The first experiment was made with the

⁷⁰ *Ibid.*

water of the Padma (the Ganges) and samples of water were collected from five different places during three different periods. The results were as follows:—

TABLE No. 6. Quantities of Silt present in Padma water at different times⁷¹

Place of collection	Total solid in solution and suspension in 100 c.c. water		
	June 19, 1939	July 15, 1939	August 7, 1939
Bohor	0.022	0.0194	0.0288
Tarpassa	0.032	0.0608	0.0658
Bhagyakul	...	0.0654	0.062
Tepakhola	0.050	0.0760	0.0502
Goalanda	...	0.0592	0.0474

Thus, the quantity of silt was less at Bohor than at the other places. The reason is not difficult to find out. At Bohor the Padma meets the Meghna and as the water of the latter contains less silt, the Padma water gets diluted on coming into contact with the water of the Meghna and, thus, its silt content is lowered.

As, however, the quantity of silt obtained from water was insufficient for mechanical or chemical analysis, a large volume of water was collected at one place, viz., Tarpassa, on the 8th August, 1939. The silt obtained from this water was examined chemically and mechanically and the following results were obtained:—

TABLE No. 7. Analytical Results of Padma Silt⁷²

I. Chemical Analysis (moisture free basis)

	<i>Per cent.</i>		<i>Per cent.</i>
Loss on Ignition	3.26	K ₂ O	...
Acid insoluble residue	74.025	CaO	...
Fe ₂ O ₃	...	Mn ₃ O ₄	...
Al ₂ O ₃	...	MgO	...
P ₂ O ₅	...	Nitrogen	...

⁷¹ *Ibid.*, p. 115, Table IV.

⁷² *Ibid.*, p. 116, Table V.

II. Mechanical Analysis

	<i>Per cent.</i>		<i>Per cent.</i>
Moisture	... 1.32	Silt	... 50.0
Organic Carbon	... 0.9856	Clay	... 18.75
Coarse sand	... 0.18	Loss on solution	... 1.40
Fine sand	... 26.32	Carbon/Nitrogen	12.35

Thus, as the mechanical analysis shows, the Padma silt contains 50 per cent. silt, 26.5 per cent. sand, and 18.75 per cent. clay. The remaining percentages are covered by moisture, organic matter, etc. The chemical analysis points out the great deficiency in potash and nitrogen, two essential ingredients of plant-food.

Although the experiments carried out so far have been a move in the right direction, still these are too few to be of any real and effective benefit for the people in general. Similar experiments on a far wider scale and with the silts of all other important rivers of the Province are to be conducted and the sooner that is done, the better would it be for all of us.

APPENDIX TO CHAPTER I
Table of Geological Divisions

Cenozoic Era		Quaternary Period	Recent
			Pleistocene or Glacial
Mesozoic Era		Neogene	Pliocene
			Miocene
Palæozoic Era (550 million years)		Eocene	Oligocene
			Eocene
Pre-Cambrian Time (1912 million years)		Cretaceous Period	Paleocene
		Jurassic Period	
		Triassic Period	
		Permian Period	
		Carboniferous Period	
		Devonian Period	
		Silurian Period	
		Ordovician Period	
		Cambrian Period	
		Algonkian	
		Archæan	

CHAPTER II

UTILISATION OF THE LAND

Classification of the Land Area.—The Province of Bengal, excepting the States of Cooch-Behar and Tripura, has, according to the *Bengal Season and Crop Report for 1939-40*, a total land area of 50,373,296 acres classified as follows:—

TABLE No. 8. Classification of Land Area in Bengal

Class	Area (in acres)	Per cent. on total area
I. Forests	4,615,159	9·16
II. Not available for cultivation	9,468,752	18·80
III. Other uncultivated land excluding current fallow*	6,630,162	13·17
IV. Current fallows	4,742,823	9·41
V. Net area cropped	24,916,400	49·46
Total Area	50,373,296	100·00

* Culturable area included in this head is 143,060 acres.

The classification of the area in different periods since 1916-17 can be noted below:—

TABLE No. 9. Classification of Land Area since 1916-17
(In Acres)¹

(1) Class	(2) 1916-17	(3) 1936-37	(4) 1939-40
I. Forests	4,379,250	4,455,316	4,615,159
II. Not available for cultivation	10,946,673	9,692,231	9,468,752
III. Other uncultivated land excluding current fallows .....	...	...	6,630,162
IV. Current fallows	5,500,853	4,690,836	4,742,823
V. Net area cropped	24,753,410	24,466,300	24,916,400
VI. Net area according to Survey	50,529,805	49,254,596	50,373,296

¹ The figures in columns 2 and 3 are taken from a pamphlet published by the Calcutta Commercial Museum.

The comparative figures since 1916-17 show that the net cropped area has practically remained the same during the last 30 years. There has been an increase in the area of culturable waste other than fallows and a decrease in the area not available for cultivation. The net area has also remained virtually stationary. It may be observed that while the net area and the net cropped area have remained unchanged, the population has, during the period 1911-41, increased from about 47 millions to 61 millions, that is, by almost 50 per cent.

It will be noted from the first table given above that the aggregate of the Net Cultivated Area actually cropped *plus* Current Fallows *plus* Culturable Waste other than Fallows, is a little over 36 million acres, which is roughly 72 per cent. of the total area.

The classification of the land areas of the different districts is as follows:—

TABLE No. 10. Classification of Area (in Acres) in the Districts (1939-40)²

District	Forests I	Not available II	Other uncultivated land ex- cluding current fallow	Current fallow IV ^a	Net area cropped V	Net area according to Survey VI
24 Parganas	1,042,815	572,680	631,840	223,175	910,500	3,381,010
Nadia	...	198,212	438,114	280,535	931,100	1,847,961
Murshidabad	...	234,992	106,396	120,872	858,700	1,320,960
Jessore	...	548,896	198,313	231,491	867,700	1,846,400
Khulna	1,482,579	239,545	441,112	78,064	833,600	3,074,900
Burdwan	...	441,779	242,408	483,133	585,000	1,752,320
Birbhum	...	299,158	182,163	16,726	617,300	1,115,347
Bankura	...	393,321	191,883	505,168	603,900	1,694,272
Midnapore	...	484,275	1,067,951	150,234	1,692,100	3,394,560
Hooghly	...	299,694	71,335	129,565	269,500	770,094
Howrah	...	50,738	90,700	106,442	87,800	335,680
Rajshahi	...	265,000	165,000	326,884	919,000	1,675,884
Dinajpur	...	500,000	267,060	548,632	1,220,800	2,536,492
Jalpaiguri	360,210	180,508	326,358	213,344	787,100	1,867,520
Darjeeling	288,164	294,197	6,332	1,387	185,600	775,680

^a Season and Crop Report, 1939-40; Agricultural Statistics of Bengal, 1939-40.

UTILISATION OF THE LAND

75

TABLE No. 10.—(Contd.)

	I	II	III	IV	V	VI
Kangpur	...	313,470	64,500	183,170	1,746,700	2,307,840
Bogra	...	120,000	108,000	81,980	564,900	874,880
Pabna	...	99,830	36,967	72,663	962,000	1,170,560
Malda	...	142,000	290,000	406,488	436,500	1,274,988
Dacca	37,702	183,800	21,070	42,328	1,471,900	1,756,800
Mymensingh	44,533	1,156,400	217,679	15,120	2,551,400	3,985,132
Faridpur	...	91,463	64,931	54,846	1,434,200	1,645,440
Bakarganj	6,080	743,634	...	51,606	1,613,400	2,414,720
Chittagong	531,210	227,745	165,720	70,425	649,700	1,644,800
Tippera	...	449,861	50,450	9,705	1,171,200	1,681,216
Noakhali	...	168,500	45,960	16,200	741,500	972,160
Chittagong Hill Tracts	821,866	769,054	1,138,820	322,640	203,300	3,255,680
Total Bengal	4,615,159	9,468,752	6,630,162	4,742,823	24,916,400	50,373,296

The percentage distribution of each class in different districts, therefore, stands as below:—

TABLE No. 11. Percentage Distribution of Areas in the Districts

District	I	II	III	IV	V	VI
24-Parganas	...	30·8	16·9	18·6	6·6	27·1
Nadia	10·8	23·7	15·1	50·4
Murshidabad	17·8	8·1	9·1	65·0
Jessore	29·1	10·7	12·5	47·7
Khulna	...	48·2	7·8	14·4	2·5	27·1
Burdwan	25·2	13·9	27·6	33·3
Birbhum	26·9	16·3	1·4	55·4
Bankura	23·3	11·3	29·8	35·6
Midnapore	14·4	31·5	4·7	49·4
Hooghly	38·8	9·2	17·0	35·0
Howrah	15·0	26·9	31·6	26·5
Rajshahi	15·9	9·8	19·5	54·8
Dinajpur	19·7	10·5	21·6	48·2
Jalpaiguri	...	19·3	9·7	17·5	11·4	42·1
Darjeeling	...	37·2	38·0	0·8	0·1	23·9
Rangpur	13·6	2·8	8·0	75·6
Bogra	13·9	12·5	9·0	64·6
Pabna	8·4	3·1	6·2	82·3
Malda	11·2	22·9	31·3	34·6
Dacca	...	2·2	10·4	1·2	2·4	83·8
Mymensingh	...	1·2	29·0	5·4	0·4	64·0
Faridpur	5·6	3·9	3·3	87·2
Bakarganj	...	0·2	30·8	...	2·1	66·8
Chittagong	...	32·3	13·8	10·0	4·3	39·6
Tippera	26·8	2·9	0·6	69·7
Noakhali	17·3	4·8	1·6	76·3
Chittagong Hill Tracts	25·3	23·6	34·9	9·9	6·3	100·0
Total Bengal	...	9·1	18·8	13·2	9·4	49·5
						100·0



Cultivable Waste.—There is another class of land in Bengal, as also in India, which has not been dealt with above. This constitutes the cultivable waste land. It has been stated as a foot-note to our Table No. 8, the first table of this Chapter, that there are 143,060 acres of culturable area included under Class III, that is, 'Other uncultivated land excluding current fallow'. This figure is given both in the *Bengal Season and Crop Report, 1939-40*, and in the *Agricultural Statistics of Bengal, 1939-40*. The figure, however, does not seem to be accurate as, of course, many other figures are. Indeed, the inaccuracy of the Government statistics has been pointed out by various authorities from time to time. The Bengal Land Revenue Commission have also expressed their unambiguous opinion on it.³ According to the Commission, the total area of cultivable waste, excluding Chittagong Hill Tracts, is 3,725,000 acres. This seems to be the more probable figure. The figure given by a Press Note of the Government of Bengal (Department of Agriculture), published in the *Statesman* of December 4, 1943, is 3,750,000 acres, and is almost the same as that of the Land Revenue Commission. This cultivable waste land is included in the Class III mentioned above.

The distribution of the cultivable waste in each district and its percentage on total area of the district are given in the following table:—

TABLE NO. 12, Distribution of the Cultivable Wastes

District	Area of Cultivable Waste (in 1,000 acres)	Percentage on total area
24-Parganas	... 136	4·0
Nadia	... 270	14·7
Murshidabad	... 126	9·5

³ Para 159 of the *L. R. C. Report*, Vol. I. "At the outset it must be observed that no dependable statistics exist in Bengal which have been prepared on a scientific basis"

TABLE No. 12.—(Contd.)

District	Area of Cultivable Waste (in 1,000 acres)	Percentage on total area
Jessore	129	6·9
Khulna	169	5·6
Burdwan	115	6·6
Birbhum	87	7·8
Bankura	253	15·2
Midnapore	373	10·9
Hooghly	48	6·2
Howrah	21	6·3
Rajshahi	92	5·5
Dinajpur	362	14·3
Jalpaiguri	127	6·7
Darjeeling	87	11·2
Rangpur	307	13·3
Bogra	24	2·7
Pabna	100	8·6
Malda	113	8·9
Dacca	31	1·8
Mymensingh	243	6·1
Faridpur	120	7·3
Bakarganj	129	5·3
Chittagong	217	13·2
Tippera	18	1·1
Noakhali	28	2·9
Total	3,725	7·9

Land Utilised and Utilisable.—From the foregoing tables the percentages of land at Present utilised and utilisable in future for purposes of cultivation in each district can be deduced as below:—

TABLE No. 13. Per cents. of Land Utilised and Utilisable for Cultivation in the Districts.
1939-40^a

1 District	2 Per cent. utilised	3 Per cent. utilisable	4 Non-cultivable
24-Parganas ...	27.1	10.6	62.3
Nadia ...	50.4	29.8	19.5
Murshidabad ...	65.0	18.6	?
Jessore ...	47.7	19.4	32.9
Khulna ...	27.1	8.1	64.8
Burdwan ...	33.3	34.2	32.5
Birbhum ...	55.4	9.2	35.4
Bankura ...	35.6	45.0	?
Midnapore ...	49.4	35.0	15.6
Hooghly ...	35.0	23.2	41.8
Howrah ...	26.5	37.9	35.6
Rajshahi ...	54.8	25.0	20.2
Dinajpur ...	48.2	35.9	?
Jalpaiguri ...	42.1	18.1	39.8
Darjeeling ...	23.9	?	75.2
Rangpur ...	75.6	?	?
Bogra ...	64.6	11.7	23.7
Pabna ...	82.3	?	?
Malda ...	34.6	40.2	25.2
Dacca ...	83.8	12.6	?
Mymensingh ...	64.0	?	?
Faridpur ...	87.2	?	?
Bakarganj ...	66.8	7.4	31.1
Chittagong ...	39.6	17.5	?
Tippera ...	69.7	1.7	28.6
Noakhali ...	76.3	4.5	19.2
Chittagong Hill Tracts	6.3	?	?
Total Bengal ...	49.5	17.3	33.2

It cannot be said definitely, however, how far the percentages calculated above on the basis of figures published

^a Column 2 represents the percentage of net cropped area on the total area of the district. Col. 3 represents the combined percentage of the area under current fallows and cultivable waste; and Col. 4 that of area under forests, area not available for cultivation and other uncultivated land.

in the different Government Reports represent the actual states of affairs. The percentages of land cropped, i.e., actually utilised, and land utilisable but not cropped at present together amount to, according to these calculations, about 66.8 per cent. The combined percentage of the net cultivated area and cultivable waste, on the other hand, according to figures collected by the Land Revenue Commission, is 70.4 per cent. of the total area of the districts. It may be observed, therefore, that, as the statistics stand at present, land suitable for cultivation in the Province amounts to roughly between 65 to 70 per cent. of the total available land. It is possible, however, that, of the area taken in the above tables as non-cultivable, there may exist lands which are cultivable even today or may be brought under cultivation with the help of irrigation, drainage and improved methods of agriculture.

The figures given in the preceding tables may be compared with those found in the *Census Report of Bengal, 1931*. Thus,

TABLE No. 14. Percentages of Cultivated and Cultivable Land, 1931

Districts	Per cent. of Cultivated on total area	Per cent. of Cultivable on total area	Per cent. of area culti-vable but not cultivated	Per cent. of cultivated to total culti-vable area
24-Parganas	23.8	45.6	21.8	
Nadia	27.8	75.0	47.2	37.0
Murshidabad	52.1	76.2	24.1	68.3
Jessore	39.1	64.7	25.6	60.5
Khulna	27.8	43.2	15.4	64.4
<i>Total Presidency Dn.</i>	<i>31.6</i>	<i>51.7</i>	<i>25.1</i>	<i>55.7</i>
Burdwan	32.2	82.3	50.1	39.1
Birbhum	55.2	87.9	32.7	62.9
Bankura	44.3	69.4	25.1	63.7
Midnapore	59.8	80.5	20.7	74.3
Hooghly	33.0	64.4	31.4	51.2
Howrah	31.4	80.8	49.4	38.9
<i>Total Burdwan Dn.</i>	<i>47.5</i>	<i>78.3</i>	<i>30.8</i>	<i>60.7</i>

TABLE No. 14—(Contd.)

Districts	Per cent. of Cultivated on total area	Per cent. of Cultivable on total area	Per cent. of area cultivable but not cultivated	Per cent. of cultivated to total cultivable area
Rajshahi ...	48.8	86.6	37.8	56.4
Dinajpur ...	42.1	80.2	38.1	52.5
Jalpaiguri ...	30.5	71.3	40.8	42.8
Darjeeling ...	21.2	32.6	11.4	65.1
Rangpur ...	72.6	86.5	13.9	83.8
Bogra ...	56.0	86.4	30.4	64.8
Pabna ...	79.5	91.1	11.6	87.2
Malda ...	51.7	86.0	34.3	60.2
Total Rajshahi Dn. ...	50.9	80.0	29.1	63.6
Dacca ...	80.5	84.9	4.4	94.8
Mymensingh ...	59.2	69.4	10.2	85.3
Faridpur ...	78.1	86.3	8.2	90.5
Bakarganj ...	80.2	89.3	9.1	89.9
Total Dacca Dn. ...	71.1	79.6	8.5	89.3
Tippera ...	69.2	72.3	3.1	95.6
Noakhali ...	76.3	82.8	6.5	92.1
Chittagong ...	43.3	54.3	11.0	79.8
Chittagong Hill Tracts	6.3	48.1	41.8	13.2
Total Chittagong Dn....	37.0	59.3	22.3	62.5
Total Bengal ...	47.7	71.2	23.5	67.0

Thus, according to the Census of 1931, 71.2 per cent. of the total area of Bengal is cultivable. But only 47.7 per cent. is actually cultivated. The remaining 23.5 per cent. of the total area, though cultivable, is not being cultivated. As a matter of fact, only 67 per cent. of the cultivable area is now under cultivation. The area not cultivable amounts to 28.8 per cent.

Double Cropped Area.—Of the net area of 24,916,400 acres cropped in the Province during the year 1939-40, the area cropped more than once was 5,312,000 acres, that is, roughly 21.3 per cent. According to the *Land Revenue Commission Report*, the area cropped more than once was 6,122,000 acres or 20.1 per cent. of the Net Cultivated Area.

The area cropped more than once in the different districts, according to the *Bengal Season & Crop Report, 1939-40*, is as follows:—

TABLE NO. 15. AREA CROPPED MORE THAN ONCE IN THE DISTRICTS

1 District	2 Net area cropped (in acres)	3 Area cropped more than once (in acres)	4 Per cent. of (2) to (1)	5 Per cent. according to—	
				L.R.C. Report	Census Report, 1931
24-Parganas	910,500	112,600	12.3	6.5	8.9
Nadia	931,100	509,300	54.7	37.8	28.2
Murshidabad	858,700	313,000	65.5	32.8	17.2
Jessore	867,700	83,000	9.4	21.2	16.6
Khulna	833,600	101,500	12.8	3.5	7.5
Burdwan	585,000	84,800	14.5	5.4	15.1
Birbhum	617,300	109,600	17.7	3.5	5.6
Bankura	603,900	37,400	6.1	3.3	2.4
Midnapore	1,692,100	13,600	0.8	2.4	0.4
Hooghly	269,500	79,600	29.4	12.7	9.0
Howrah	87,800	21,700	24.1	16.3	6.9
Rajshahi	919,000	218,800	23.7	17.7	15.1
Dinajpur	1,220,800	10,000	0.8	9.8	...
Jalpaiguri	787,100	25,700	3.2	5.1	12.8
Darjeeling	185,600	16,900	8.7	14.0	7.0
Rangpur	1,746,700	...	...	...	...
Bogra	504,900	180,200	31.9	13.7	18.7
Pabna	962,000	210,200	21.8	34.4	30.5
Malda	436,500	65,000	12.6	27.9	9.4
Dacca	1,471,900	372,100	25.2	34.7	18.6
Mymensingh	2,551,400	1,212,900	47.5	32.8	44.8
Faridpur	1,434,200	238,100	16.6	31.4	10.5
Bakarganj	1,613,400	573,400	35.5	14.7	7.3
Chittagong	649,700	35,800	5.4	22.3	4.2
Tippera	1,171,200	233,200	19.9	36.0	28.2
Noakhali	741,500	463,600	62.2	36.1	57.5
Chittagong Hill Tracts	203,300	...	...	...	...
Total Bengal	24,916,400	5,312,000	21.3	20.1	14.1

Area Irrigated.—Of the gross cultivated area in Bengal of 30,228,400 acres in 1939-40, the total area irrigated from different sources amounted to 2,051,302 acres⁵ or only 6.7 per cent. According to the *Census Report of Bengal*,

⁵ B. S. & C. Report, 1939-40.

1931, however, the area irrigated in the whole of Bengal had stood at only 3·8 per cent. of the gross cultivated area.⁶ The figure given by the Agricultural Commission, on the other hand, is 6·2 per cent.⁷ It should be pointed out that Bengal has had a very low percentage of irrigated area as compared with those of other provinces of India. Thus,

TABLE No. 16. Proportion of Area Irrigated to Total Area Sown in the Provinces

Province	Per cent. of Area Irrigated according to—	
	A. C. Report (1928)	B.P. & R.E.C. Report (1940) ⁸
Punjab	44·1	54
N. W. F. Province	34·4	44
Ajmere-Merwara	...	38
United Provinces	...	30
Delhi	22·0	29
Madras	29·7	28
Bihar and Orissa	17·4	21
Bombay	“	16
Assam	5·7	11
Bengal	6·2	7
Central Provinces & Berar	4·2	4
Coorg	...	3

* Bombay proper 3·9 and Sind 73·7.

Thus, excepting Central Provinces and Berar, Bengal has the lowest percentage of irrigated area among all the major provinces. Even minor provinces and Administrations have greater percentages than that of Bengal. It is, of course, true, as observed by the Bengal Paddy and Rice Enquiry Committee, that the districts of Eastern Bengal, where normally there is not a large need of irrigation, account mainly for the low percentage of irrigated lands

⁶ *Census Report of Bengal, 1931*, p. 66.

⁷ *Agricultural Commission Report*, p. 326.

⁸ Para 14 of the Report.

in Bengal as a whole; nevertheless, the inadequacy of the irrigation facilities is a great handicap to our agriculture.

The area irrigated and its percentage on total cropped area in each district are given in the table below:—

TABLE NO. 17. Area (in Acres) Irrigated in the Districts

District	Area irrigated	Gross cultivated area	Per cent. of irrigated on gross cultivated area according to—	
			Census Report, 1931	B.S. & C. Report
24-Parganas	...	1,023,100	...	...
Nadia	478	1,440,400	0·02	0·03
Murshidabad	166,894	1,171,700	16·0	14·2
Jessore	...	950,700	...	...
Khulna	...	935,100	...	...
<i>Presidency Dn.</i>	...	...	2·0	...
Burdwan	339,509	669,800	19·0	50·6
Birbhum	256,172	726,900	19·9	35·2
Bankura	416,321	641,300	22·1	64·9
Midnapore	388,978	1,705,700	7·3	22·8
Hooghly	69,340	349,100	10·7	19·8
Howrah	5,860	109,500	1·9	5·4
<i>Burdwan Dn.</i>	...	...	14·2	...
Rajshahi	19,300	1,137,800	1·4	1·6
Dinajpur	...	1,220,800	...	...
Jalpaiguri	149,600	812,800	7·9	18·4
Darjeeling	53,950	202,500	7·7	26·6
Rangpur	...	1,746,700	...	...
Bogra	...	745,100	...	...
Pabna	...	1,172,200	...	...
Malda	96,000	501,500	8·1	19·1
<i>Rajshahi Dn.</i>	...	...	2·6	...
Dacca	...	1,844,000	...	...
Mymensingh	61,900	3,764,300	1·6	1·6
Faridpur	...	...	...	...
Bakarganj	...	2,186,800	...	...
<i>Dacca Dn.</i>	...	...	0·6	...
Tippera	...	1,404,400	...	...
Noakhali	...	1,205,100	...	...
Chittagong	27,000	685,500	1·9	3·9
Chittagong Hill Tracts	...	203,300	...	...
<i>Chittagong Dn.</i>	...	...	0·4	...
Bengal	2,051,302	30,228,400	3·8	6·7



Thus, the highest percentage of irrigated acreage is found in the districts of Burdwan Division. Birbhum, Burdwan, Bankura and Midnapore, for instance, account for nearly 70 per cent. of the total irrigated lands in Bengal.* The districts of 24-Parganas, Jessore and Khulna in the Presidency Division; Dinajpur, Rangpur, Bogra and Pabna in the Rajshahi Division; Dacca, Faridpur and Bakarganj in the Dacca Division; and Tippera, Noakhali and Chittagong Hill Tracts in the Chittagong Division have no recorded irrigated area. So, apparently there are no irrigation facilities in 13 out of 27 districts. In most of these districts, however, there are considerable areas under rivers and *khals* which supply water for cultivation. The water areas of some districts are given below:—

TABLE NO. 18. Water Area in certain Districts

District	Water Area (in acres)	Per cent. of water area on total cropped area
Dacca	... 117,856	6·3
Faridpur	... 162,560	9·7
Bakarganj	... 902,400	18·4
Bankura	... 217,832	33·9
Pabna	... 58,000	11·5

Distribution of the Gross Cultivated Area under Different Crops.—The percentage distribution of the gross cultivated area under various important crops would go to show how the land is actually utilised in this Province. Thus,

* B. P. & R. E. C. Report, p. 114.

TABLE NO. 19. Percentage Distribution of the Gross Cultivated Area¹⁰

District	Rice	Other cereals & pulses	Jute	Fruits & Vegetables	Sugar, drugs & narcotics	Podder, oil-seeds and other crops
24-Parganas ..	84.6	3.4	8.0	2.1	0.6	1.3
Nadia ..	74.5	8.8	6.4	0.6	1.2	8.5
Murshidabad ..	63.7	17.4	3.7	7.1	0.4	7.7
Jessore ..	76.8	5.2	11.0	0.3	2.5	4.2
Khulna ..	89.9	1.1	3.7	1.6	0.6	3.1
<i>Presidency Dn.</i> ..	<i>78.0</i>	<i>7.7</i>	<i>6.6</i>	<i>2.3</i>	<i>1.0</i>	<i>5.0</i>
Burdwan ..	88.1	3.9	0.4	3.2	2.0	2.4
Birbhum ..	93.5	2.5	...	1.7	1.4	0.9
Bankura ..	89.9	4.5	...	1.4	0.5	3.7
Midnapore ..	94.4	1.9	0.4	0.6	0.5	2.2
Hooghly ..	75.0	2.4	9.7	2.7	7.7	2.5
Howrah ..	80.5	4.8	5.6	5.4	2.3	1.4
<i>Burdwan Dn.</i> ..	<i>90.8</i>	<i>2.9</i>	<i>1.0</i>	<i>1.6</i>	<i>1.4</i>	<i>2.3</i>
Rajshahi ..	68.5	11.6	8.2	3.0	1.1	7.6
Dinajpur ..	81.7	1.3	6.9	0.5	4.2	5.4
Jalpaiguri ..	63.4	2.1	5.6	2.1	21.3	5.5
Darjeeling ..	18.1	34.3	2.3	1.3	37.2	6.8
Rangpur ..	56.7	4.0	19.7	1.4	12.4	5.8
Bogra ..	70.2	5.4	16.1	0.9	0.9	6.5
Pabna ..	61.3	10.4	13.0	0.1	0.8	14.4
Malda ..	67.5	17.6	5.4	0.3	0.6	8.6
<i>Rajshahi Dn.</i> ..	<i>64.9</i>	<i>7.8</i>	<i>11.4</i>	<i>1.2</i>	<i>6.9</i>	<i>7.8</i>
Dacca ..	53.4	5.4	22.4	6.3	1.8	10.7
Mymensingh ..	61.7	2.7	20.8	1.9	0.9	12.0
Faridpur ..	55.2	10.7	23.8	4.2	1.0	5.1
Bakarganj ..	83.7	3.3	2.7	8.1	1.4	0.8
<i>Dacca Dn.</i> ..	<i>64.1</i>	<i>4.6</i>	<i>17.5</i>	<i>4.5</i>	<i>1.2</i>	<i>8.1</i>
Tippera ..	71.4	3.7	20.9	0.4	0.3	3.3
Noakhali ..	81.0	3.2	5.3	6.8	0.2	3.5
Chittagong ..	92.5	0.5	0.04	0.84	2.1	4.02
Chittagong Hill Tracts ..	48.5	2.4	...	2.3	2.4	44.4
<i>Chittagong Dn.</i> ..	<i>77.4</i>	<i>2.8</i>	<i>10.4</i>	<i>2.8</i>	<i>0.7</i>	<i>5.9</i>
<i>Total Bengal</i> ..	<i>72.5</i>	<i>5.3</i>	<i>10.7</i>	<i>2.6</i>	<i>2.6</i>	<i>6.3</i>

Thus, rice takes more than 72 per cent. of the gross cultivated area, and jute takes a little less than 11 per cent. All other crops are grown on only 16.3 per cent. of the gross cultivated area. The actual area under crops in Bengal will be found in Chapter VI.

¹⁰ *Census Report of Bengal, 1931, p. 66.*

CHAPTER III

POPULATION

I. GENERAL SURVEY

I. Total Population.—The Province of Bengal (that is, excluding the States of Cooch Behar and Tripura) has, according to the Census of 1941, a total population of 60,306,525. The two states named have a total of 1,153,852. The corresponding numbers in 1931 were 50,116,000 and 1,863,000, which means that the population increased during the decade 1931-41 by 20·3 per cent. and 14·9 per cent. respectively. The increase had been 7·2 per cent. during the decade 1921-31 for the whole Province including the States.

As compared with the population figures for Bengal in 1931, those of other countries or provinces in or about the thirties may be noted below:—

TABLE No. 20. Population of Bengal compared to those of other Countries and Provinces

Country and Province	Population in millions
Bengal (1931) ...	... 50·11
Bombay* (excluding Sind, Aden and Bombay City) [1931] ...	... 17·99
Madras* (1931) ...	... 44·98
Punjab* (1931) ...	... 23·58
United Provinces* (1931) ...	... 48·40
Central Provinces* (1931) ...	... 15·50
Bihar and Orissa (1931) ...	... 37·67
Great Britain (1931) ...	... 47·32
France ...	... 42·00
Germany ...	... 65·75
Italy ...	... 48·31
Japan (1931) ...	... 65·13
New York ...	... 12·59

* The figures exclude the populations of States and Agencies. The figures for Japan are calculated by adding to the figures of 59,737,000 recorded in 1925 Census an annual increase of 900,000 for 6 years.¹

¹ Cf. Orchard, *Japan's Economic Position* (1930); p. 4.

POPULATION

87

2. *The Rate of Increase.*—The progressive increase in the population of Bengal from decade to decade can be seen from the following table:—

TABLE NO. 21. Variation in the Population of Bengal since 1872

Census Year		Population in millions	Percentage increase
1872	...	34·6	6·7
1881	...	37·0	6·7
1901—1911	...	46·3	8·0
1891—1901	...	42·8	7·7
1901—1911	...	46·3	8·0
1911—1921	...	47·5	2·8
1921—1931	...	51·0	7·3
1931—1941	...	60·3	20·3

Thus, the aggregate percentage of increase of population since 1881 has been 62·9, that is, roughly speaking, the population of the Province has increased by a little over one per cent. per annum. It may incidentally be pointed out that during 50 years ended 1931 the population of Bengal increased by 38 per cent.² as compared to a total increase of 53·8 per cent. during the same period in England and Wales.³ And, the total percentage variations in population during 1901-41 in the different provinces as compared to that in Bengal will be noted from the table below:—

TABLE NO. 22. Total Percentage Variation in Population in the Provinces since 1901⁴

Province	Percentage variation	Province	Percentage variation
Bengal	... + 43·1	Sind	... + 41·2
Punjab	... + 42·5	Madras	... + 36·1
Central Provinces and Berar	... + 42·0	Bombay	... + 36·1
		Bihar	... + 28·6

² *Census Report of India, 1931, Vol. I, Part I, p. 14.*

³ *Ibid., p. 5.*

⁴ *Census Report, 1941, Vol. I, Part I, p. 69.*

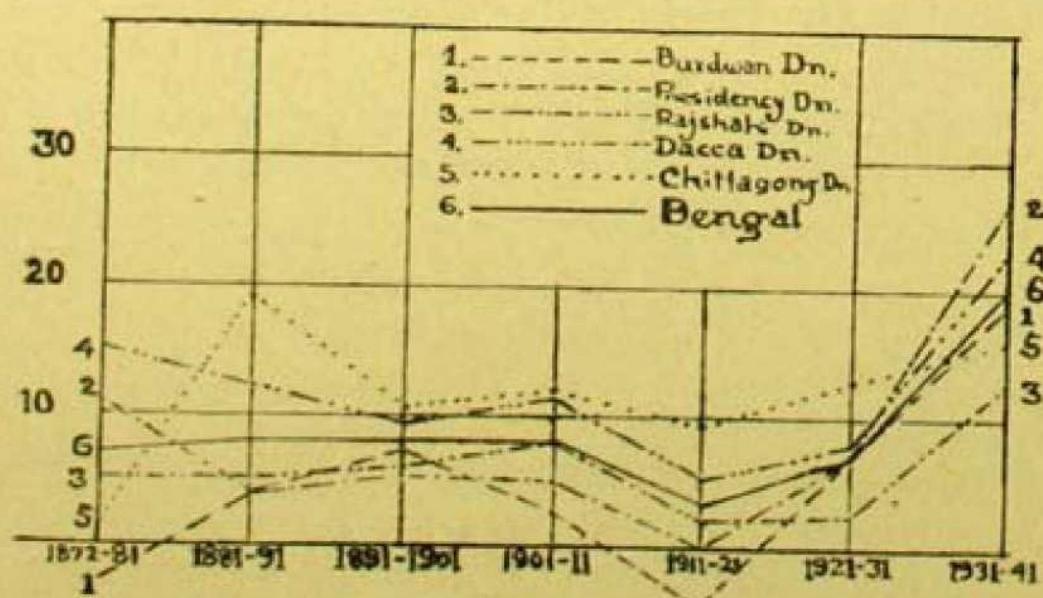
So, Bengal has had the largest total increase in her population since 1901 as compared with those of other provinces noted above. Coming to the lesser units, we find that the percentage variations in the population of the five Divisions of the Province have been as shown in the following statement:—

TABLE NO. 23. Percentage Variations of Population in the Divisions, 1872-1941

Division	Variation per cent. of population during 1872- 1941						
Burdwan ..	1931-41 +18.97	1921-31 + 7.4	1911-21 -4.9	1901-11 + 2.8	1891-01 + 7.2	+ 4.0	- 2.8
Presidency ..	+26.80	+ 7.0	+0.4	+5.1	+ 5.4	+ 3.9	+10.5
Rajshahi ..	+12.86	+ 2.7	+2.0	+ 8.2	+ 6.2	+ 4.7	+ 4.8
Dacca ..	+20.34	+ 8.2	+7.1	+11.4	+ 9.6	+13.0	+14.6
Chittagong ..	+24.30	+13.0	+9.8	+13.8	+13.0	+17.4	+ 3.8
Total Bengal ..	+20.30	+ 7.3	+2.8	+ 8.0	+ 7.7	+ 7.5	+ 6.7

A graphical representation of this table is given below:

Diagram No. 4. Percentage Variation of Population in Bengal since 1872



3. *Population in the Districts.*—The population in the districts of Bengal is given in the table which follows:—

TABLE NO. 24.
Population in the Districts of Bengal

District	Total population (in thousands)		Increase (+) or Decrease (-) during the decade (in thousands)
	1941	1931	
Burdwan	1,991	...	...
Birbhum	1,048	...	...
Bankura	1,290	...	...
Midnapore	3,191	...	...
Hooghly	1,378	...	...
Howrah	1,490	...	...
<i>Burdwan Dn.</i>	10,388	8,648	+ 1,740
24-Parganas	3,536	...	...
Calcutta	2,109	...	...
Nadia	1,760	...	...
Murshidabad	1,640	...	...
Jessore	1,828	...	...
Khulna	1,943	...	...
<i>Presidency Dn.</i>	12,816	10,066	+ 2,750
Rajshahi	1,572	...	...
Dinajpur	1,927	...	...
Jalpaiguri	1,089	...	...
Darjeeling	376	...	...
Rangpur	2,878	...	...
Bogra	1,260	...	...
Pabna	1,705	...	...
Malda	1,233	...	...
<i>Rajshahi Dn.</i>	12,040	10,668	+ 1,372
Dacca	4,222	...	...
Mymensingh	6,024	...	...
Faridpur	2,889	...	...
Bakarganj	3,549	...	...
<i>Dacca Dn.</i>	16,684	13,864	+ 2,720
Tippera	3,860	...	...
Noakhali	2,217	...	...
Chittagong	2,153	...	...
Chittagong Hill Tracts	247	...	...
<i>Chittagong Dn.</i>	8,447	6,826	+ 1,651
Bengal (excluding the States)	60,405	50,082	+ 10,313
Cooch-Behar	640	...	...
Tripura	513	...	...
Sikkim	121	...	...
<i>Total Bengal</i>	61,670	...	...

Bengal Districts and the States of the United States of America.—A comparison has been made in the *Census Report of Bengal, 1931*, of the Bengal districts with the constituent States of the United States of America. The population of the former, as recorded in the Census of 1931, has been compared with that of the latter as found in the Census of 1930. Of the 49 sovereign States, only six are more populous than Mymensingh, which had the largest population in Bengal in 1931. Another six are more populous than Tippera, the third most populous district in Bengal. No less than sixteen States have had a smaller population than any Bengal district except Darjeeling and Chittagong Hill Tracts. But the average land area of each State is 60,689 square miles or almost four-fifths that of the whole of Bengal excluding the Native States.⁵

4. *Density of Population.*—There has not only been a steady increase in the total population of Bengal, but, what is more significant, there has been a corresponding increase in the number of persons per square mile of territory. Thus,

TABLE NO. 25.
Variations in Mean Density per Square Mile in Bengal

Year	No. of persons per sq. mile	Year	No. of persons per sq. mile
1872	422	1911	563
1881	450	1921	578
1891	484	1931	646
1901	521	1941	742

It has been estimated in the West that even under the most favourable conditions agriculture can support not more than 250 persons per square mile.⁶ But Bengal's agriculture is required to support, according to the Census of 1941, 742 persons per square mile. The average density

⁵ *Census Report of Bengal, 1931*, p. 18.

⁶ Cf. Vera Anstey, *The Economic Development of India*, p. 40.

of population in Bengal as compared to those of other provinces and countries can be seen as given below:—

TABLE NO. 26.

Average Density of Population per Square Mile, 1931

Provinces	Density per sq. mile [†]	Countries	Density per sq. mile [‡]
Bengal	... 646	Great Britain	... 525
Bombay	... 176	France	... 198
Madras	... 329	Germany	... 363
Punjab	... 241	Italy	... 292
United Provinces	... 456	Japan	... 440
Central Provinces & Berar	... 456	New York State	... 296
Bihar and Orissa	... 453	United States	... 41
Assam	... 167	U.S.S.R.	... 21
N.-W. F. Province	179	Europe	... 127

Thus, the average or mean density of population in Bengal, excluding that of the States of Cooch Behar and Tripura, was, in 1931, 646, which was the maximum figure not only of all the provinces of India but also of all the important countries noted above. In Great Britain, the population of England and Wales, however, recorded a higher figure. The mean density per square mile there was 685. Bengal has an area of more than two-fifths as large as that of England and Wales together, but its population was, in 1931, a little more than a quarter as large as that of the two. But in Bengal, too, there are regions where the mean density is much higher than that of the whole Province and even higher than that of England and Wales taken together. This can be observed from the following table which shows the mean density of each district in 1931 and its percentage variation since 1872:—

[†] *Census Report of India, 1931, Vol. V, Part I, p. 22.*

[‡] These figures have been arrived at by dividing the population of each country by its total area in square mile.

TABLE No. 27.

Density of Population with Variations per cent by Districts,
1873-1931*

District	Mean density (persons per sq. mile)								Varia-tions per cent. during
1. West Bengal	1931	1921	1911	1901	1891	1881	1872	1872-1931	
Burdwan ..	618	581	611	595	555	534	545		13.71
Birbhum ..	583	532	572	570	517	518	552		6.3
Bankura ..	558	483	534	515	456	452	486		10.7
Midnapore ..	424	389	434	426	408	397	370		14.8
Highly ..	534	528	558	552	521	498	503		10.1
Howrah ..	938	909	918	883	870	821	942		0.5
Burdwan Dn.	2,105	1,882	1,850	1,668	1,497	1,324	1,247		72.8
2. Central Bengal	566	543	541	515	489	470	425		36.4
24-Parganas	516	541	502	429	390	349	326		81.8
Nadia ..	531	535	580	594	586	593	535		65.9
Murshidabad	656	595	640	622	584	572	567		2.0
Jessore ..	576	593	601	620	644	663	496		14.0
Khulna ..	347	307	288	264	248	228	221		0.2
Calcutta ..	36,265	43,231	42,670	40,371	32,491	29,157	30,143		54.1
Presidency Dn.	566	543	541	515	489	470	425		36.4
3. North Bengal	550	538	528	489	463	444	422		31.1
Rajshahi ..	548	569	566	558	549	553	543		0.8
Dinajpur ..	445	432	428	397	376	366	362		22.3
Jalpaiguri ..	335	319	309	269	233	198	143		135.9
Darjeeling ..	264	243	228	214	192	134	82		236.4
Rangpur ..	742	717	686	619	594	603	619		20.7
Bogra ..	785	760	724	628	562	505			69.3
Pabna ..	795	828	851	847	812	782			19.0
Malda ..	597	538	548	481	443	387			53.9
Cooch-Behar State ..	448	450	454	434	443	481	407		10.9
Rajshahi Dn.	557	543	533	493	464	443	423		32.4
4. East Bengal	688	625	577	153	453	405	362		90.1
Dacca ..	1,265	1,148	1,066	952	861	752	657		90.8
Mymensingh	823	776	724	627	556	489	377		117.9
Faridpur ..	1,003	949	905	833	785	716	658		53.3
Bakarganj ..	834	752	695	656	616	544	540		57.2
Dacca Dn. ..	935	386	809	726	662	586	511		83.3
Tippera ..	1,197	1,072	972	848	713	606	562		114.8
Noakhali ..	1,124	972	792	694	614	499	511		102.9
Chittagong ..	699	645	605	543	518	554	452		59.4
Chittagong Hill Tracts	43	34	30	24	21	20	14		205.9
Tripura State ..	93	74	56	42	34	23	9		984.7
Chittagong Dn. ..	584	512	467	410	363	309	298		95.8
Bengal ..	616	578	563	521	484	450	422		47.25

* Census Report of India, 1931, Vol. V, Part I, p. 66. The Census

Thus, the districts which have larger densities than that of England and Wales taken together are :—

TABLE NO. 28.

Districts with Higher Density than that of
England and Wales

District	Mean density per sq. mile (1931)	District	Mean density per sq. mile (1931)
Howrah	2,105	Bakarganj	834
Dacca	1,265	Mymensingh	823
Tippera	1,197	Pabna	795
Noakhali	1,124	Bogra	785
Faridpur	1,003	Rangpur	742
Hooghly	938	Chittagong	699

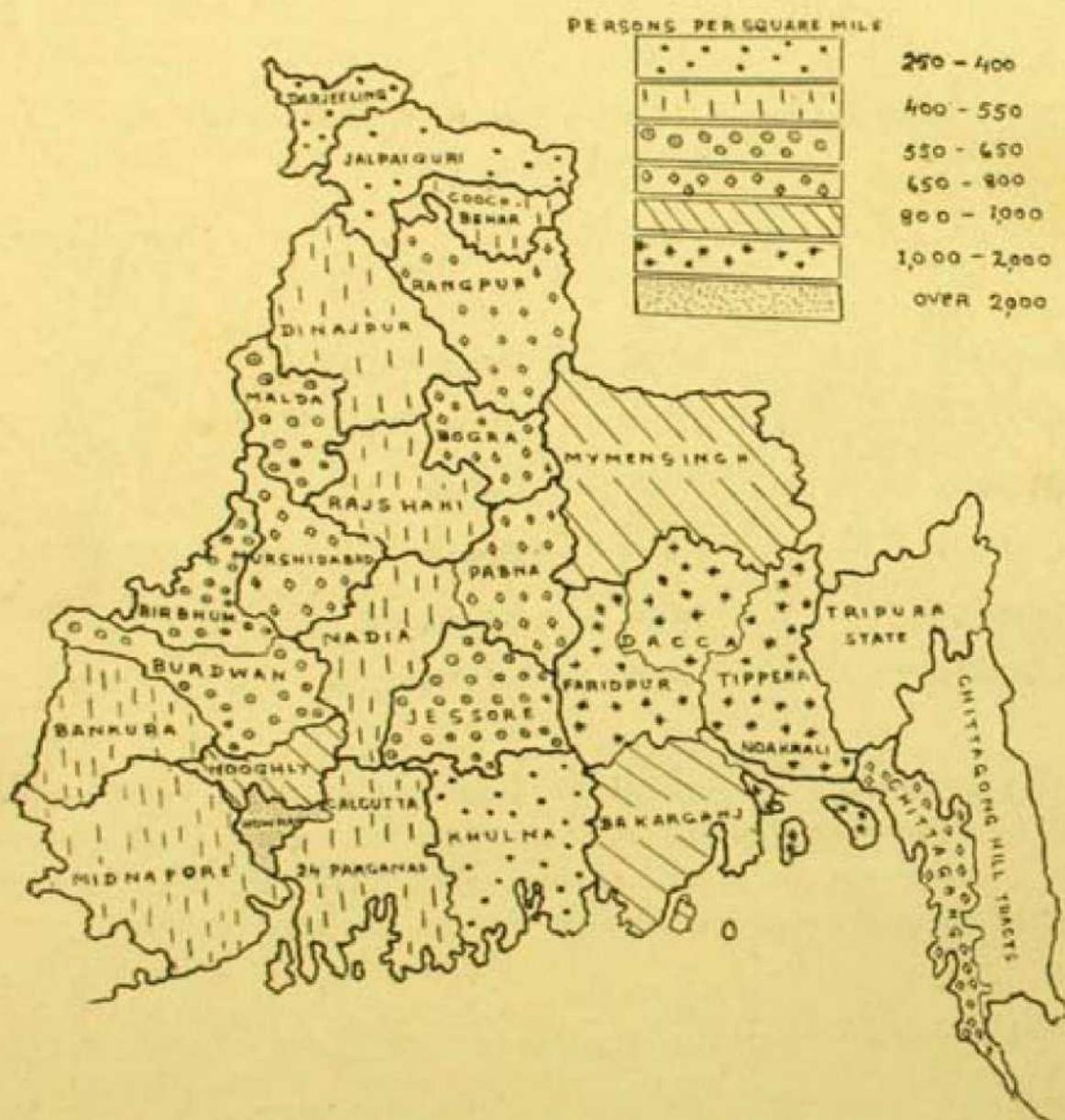
The density of Bengal, excluding Calcutta, varies from 2,105 in Howrah district to 43 in the Chittagong Hill Tracts. The following diagram would show the density of the district populations according to the Census of 1931.

of 1941 recorded further increase in the mean density of every district. Thus,

Burdwan	699	Calcutta	62,578	Dacca	1,542
Birbhum	601	Presidency Dn.	781	Mymensingh	979
Bankura	487			Faridpur	1,024
Midnapore	605			Bakarganj	938
Hooghly	1,142	Rajshahi	622	Dacca Dn.	1,077
Howrah	2,657	Dinajpur	487		
Burdwan Dn.	728	Jalpaiguri	357	Tippera	1,525
		Darjeeling	316	Noakhali	1,337
24-Parganas	957	Rangpur	798	Chittagong	838
Nadia	611	Bogra	855	Chittagong Hill	
Murshidabad	795	Pabna	929	Tracts	49
Jessore	625	Malda	615	Chittagong Dn.	721
Khulna	404	Rajshahi Dn.	613		

Diagram No. 5.

Density of District Population, 1931¹⁰



As the diagram shows, by far the greater part of the Province has a density of over 500 per square mile. Howrah has the largest density, it being over 2,000 per square mile. After Howrah, Dacca, Faridpur, Tippera and Noakhali

¹⁰ Adapted from the *Census Report of Bengal, 1931*, Diagram No. 1-11.

form a solid block with a density of between 1,000 and 2,000 per square mile. Mymensingh on the north of this block and Bakarganj on the South, and Hooghly are the only three districts, the population of which has a density of between 800 and 1,000 persons to the square mile. The next most densely populated districts attach themselves to these two formations. Rangpur, Bogra and Pabna, on the one hand, and Chittagong, on the other, adjoining the block formed by Mymensingh, Dacca, Faridpur, Tippera, Noakhali and Bakarganj, have a population of 650 to 800 persons a square mile. Murshidabad with 656 and Burdwan, Birbhum and Malda with between 550 and 650 continue the line of Howrah and Hooghly northwards. Jessore has a density of 576, almost the same as that of the last. A narrow strip of territory running down the centre of the Province and comprising Dinajpur, Rajshahi, Nadia and 24-Parganas, has a density of between 400 to 450 per square mile. The Sunderbans area of 24-Parganas has, however, a much lower density. Bankura and Midnapore have densities similar to the last set of districts, while the districts of Darjeeling and Jalpaiguri have between 250 and 400 persons to the square mile. Khulna has a lower density since large parts of it lie in the Sunderbans area.

When still smaller units are taken, the density is found to rise much higher. The names of the police-stations having a density of population of 1,000 or over are given below:—

TABLE No. 29.
Police Stations having Density of 1,000 and Over
Mean density per sq. mile (1931)*

Dacca District—935 (1,542)

Munshiganj Subdivision—2,413 (2,597)

Lohajang P.S.	—3,228	}
Tongibari ..	—3,044	
Srinagar ..	—1,895	

* Figures in parenthesis are those of 1941 Census.



Narayanganj Subdivision—1,444 (1,846)

Narayanganj P.S. — 3,000

(No single P.S. has less than 1,000)

Sadar Subdivision—982 (1,218)

Dohar P.S.—2,049

Dhamrai, Nawabganj and Keraniganj each
over 1,000

Mymensingh District—823 (979)

Nagarpur, Gopalpur, Tangail and Sarishabari
P.S. each—over 1,000

Bhairab Bazar, Kuliarchar, Kathiadi, Hossainpur,
Kishenganj and Karimganj each—between
1,300 and 1,600

Bakarganj District—834 (938)

Kowkhali, Bhandaria, Pirojpur, Swarupkati,
Banaripara, Jhalakati, Rajapur, Nalchiti,
Bakarganj, Barisal, Babuganj, Uzirpur,
Gaurnadi and Muladi each—no less than
1,050

Faridpur District—1,003 (1,024)

Sadarpur, Matbarerchar, Bhanga, Sibchar, Rajair,
Madaripur, Palong, Bhedarganj, Gosairhat
and Kalkuni each—no less than 1,050

Naria P.S.—2,206

Tippera District—(1,525)

All excepting 2 P.S.—over 1,000

Noakhali District—1,124 (1,337)

All excepting 2 P.S.—over 1,000

Chittagong District—699 (838)

Chittagong P.S.—9,239 (21,955)

Double Moorings, Pachalais, Boalkhali each
—between 1,400 and 2,425

Raojan, Hathazari, Anwara and Patna each
—between 1,050 and 1,300

TABLE NO. 29.—(*Contd.*)

Pabna District—795 (929)

Sirajganj P.S.—1,336 (1,516)

Shazadpur, Chanhali, Kamarkhanda, Belkuchi
each—more than 1,000

Bera—1,051 (1,212)

Bogra District—785 (855)

Bogra, Gabtoli each—over 1,000

Rajshahi District—548 (622)

Boalia P.S.—2,283

Rangpur District—792 (798)

Saidpur P.S.—1,150 (1,468)

24-Parganas District—516 (957)

Basirhat P.S.—over 1,050 (1,239)

Khulna District—347 (404)

Khulna, Daulatpur each—over 1,050

Howrah District—2,105 (2,657)

Bowria P.S.—5,124 (5,445)

Almost all other P.S. have—over 1,000

Hooghly District—(1,142)

Almost all P.S. have—over 1,000

Midnapore District—534 (605)

Moyna P.S.—4,229

Burdwan District—583 (699)

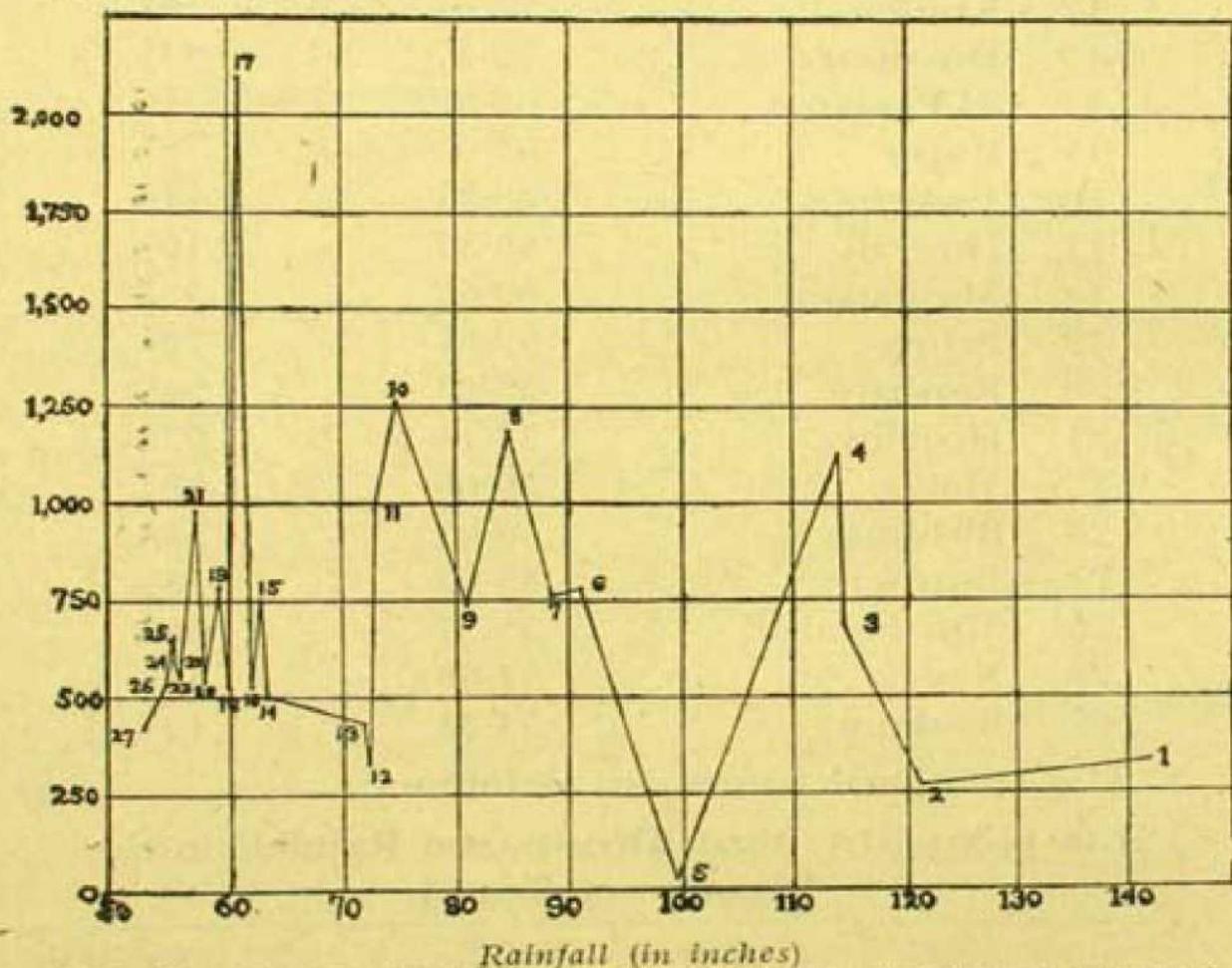
Asansole, Kulti, Raniganj each—1,050 (2,318).

From the above survey it will be seen that the police-stations in the district of Dacca have generally a very high density of population, and the number of such police-stations is also fairly high. The districts of Mymensingh, Bakarganj and Faridpur in Dacca Division have a large number of police-stations, the population of which runs more than 1,000 to the square mile. In Chittagong Division, all the police-stations of Tippera and Noakhali, except only two in each, have a density of over 1,000. The district of Chittagong has eight police-stations having

A graphical representation of the relation between rainfall and density of population in Bengal is given below:—

Diagram No. 6. Correlation between Rainfall and Density of Population

Density per square mile



N.B. The figures in the graph indicate the districts as arranged in Table No. 30.

Thus, excepting Chittagong and Burdwan Divisions, there is generally a correlation between rainfall and the density of population. The Chittagong Division is really not an exception. The sparsely populated Chittagong Hill Tracts and the Tripura State have greatly lowered the density of that Division. Taking the principal districts of Tippera, Noakhali and Chittagong, both the rainfall and

density are found to be very high. As to the Burdwan Division which, though it receives the lowest rainfall, has a density of population greater than those of Rajshahi and Presidency Divisions, it should be noted that the concentration of population around Calcutta has raised its density. It may, therefore, be said to be generally true that the density of population in Bengal varies directly, or rather tends to vary directly, with the amount of rainfall.

6. *Factors determining the Density of Population.*— But however important influence rainfall might have had on density, it is not the only determining factor. There are other factors which influence greatly the density of population. Indeed, to these 'other factors' is to be attributed the fact that the Rajshahi and Presidency Divisions have less number of persons to the square mile than what is found in the Burdwan Division even though the latter has a lower rainfall than the former two. Again, in all the districts where higher rainfall is accompanied with lower density, these 'other factors' play far more important role than the rainfall. The districts of Darjeeling and Jalpaiguri have the maximum rainfall but the density there is the lowest. So also is the case with the Chittagong Hill Tracts. Again, Baksa-Duar receives the highest rainfall in Bengal, its average annual record being 201.83 inches, but its density is lower than that of any other region in Bengal. Here, too, those other factors are far more important than rainfall.

Now, the 'other factors' are mainly the configuration of the country, and the character and fertility of the soil. The configuration of the country explains why Darjeeling and Jalpaiguri, inspite of having the maximum rainfall, have the minimum density. It, again, explains why Chittagong having the same rainfall as that of Noakhali, has a much lower density. Such disparities as are found in other districts as between rainfall and density are mainly due to the peculiar configuration of the country. Large tracts of the districts of Jalpaiguri, Darjeeling and Chittagong Hill

Tracts being mountainous and covered with dense forests, cultivation is not possible there, and hence people do not ordinarily want to go there unless forced by circumstances. It is true that the slopes of hills are very fertile and excessive pressure of population on land in the plains may in future force people, as in Japan, to ascend on and cultivate the slopes, when the density would rise there too. It can seldom, however, be equal to what is found in the fertile tracts of the plains.

So far as fertility is concerned, it has, of course, had an important part in the determination of the density of population. As a matter of fact, some notable economists once observed that people in the past first settled down on the most fertile tracts and as these proved insufficient they gradually occupied less and less fertile lands. Historically, however, this has not been the whole truth. People no doubt wanted the most fertile tracts but they had to confine themselves rather to the most accessible. Most fertile lands might have been located in the most inaccessible places. Indeed, whatever effect fertility may have on density, it should be noted that unless the configuration and rainfall are favourable fertility does have but little influence. The slopes of the hills, as we have said, are very fertile and the eastern hills of India receive sufficient and unfailing rains every year, but their configuration prevents people from going and settling there in large numbers. Again, there are large tracts in Western Bengal, which are not less, even though not more, fertile than many fertile tracts of Eastern Bengal, but due to insufficiency of rainfall and to lack of arrangements for artificial watering, the former places have less persons to the square mile than the latter. It is configuration also that explains the low density in Central Bengal even though land is there fairly fertile and the rainfall is greater than those of many parts of Northern and Western Bengal. The eastern swings of the rivers, as a result of which large tracts in Central Bengal have now been converted into swamps and jungles making

those tracts highly malarious and breeding grounds of other virulent diseases, have been responsible for thinning down the population of Central Bengal, while at the same time increasing the population in the east. Ever since the dawn of human history people have moved along with the courses of rivers. The same thing is happening today in Bengal. The greatest change of population distribution has been as between east and west along with the eastern recession of the main rivers. The median of population has made an uninterrupted recession eastwards illustrating the proportionately larger growth of population in Eastern than in Western Bengal. The population in the 'active delta' of the east is increasing as fast as it is decreasing in the central or 'moribund delta'. This can be seen from the following figures:—

TABLE NO. 32. Percentage Variation of Population in the Old and New Deltas of Bengal¹²

	Percentage variation during—		
	1931-41	1901-31	1872-1931
Districts in the moribund delta :			
Burdwan	+20·0	+ 6·3
Nadia	+15·1	+ 2·0
Murshidabad	+19·6	+14·0
Jessore	+ 9·4	+ 0·2
Hooghly	+23·6	+ 0·5
Districts in the active delta :			
Dacca	+22·5	+ 90·8
Mymensingh	+17·4	+ 90·8
Faridpur	+20·4	+ 53·3
Bakarganj	+20·8	+ 57·2
Tippera	+26·3	+114·8
Noakhali	+29·9	+102·9

The configuration, the rainfall, the fertility—all the factors influencing the density have favourably combined

¹² *Census Report of India, 1931, Vol. V, Part I, p. 66.*

in the eastern districts, that is, in the active delta to bring about a high density there. In North Bengal, larger densities are to be found in the districts of Pabna, Bogra and Rangpur than in other districts. This is because these three districts lie on the right bank of the Brahmaputra which is now the most active river in the Province. Besides, Pabna is also washed by the Ganges along its entire southern border, Rangpur by the Teesta and Bogra by Karatoa. Rajshahi and Malda are also riparian districts, being situated on the northern banks of the Ganges and, as such, both of them annually receive spill water of the river over large areas. But the Ganges now being much less active than the mighty Brahmaputra, the extent of the spread of the spill water of the former is considerably less than that of the latter. Hence, the contribution of the former to the productive capacity of the soil is much less than that of the latter. Again, Dinajpur, though it has a larger rainfall than those of Bogra, Pabna, Rajshahi and Malda, has the lowest density of all the five districts. This is not only due to the fact that large parts in the north and west of the district are hilly, but also to the absence of a large river flowing by or through it. Similarly, the absence of large rivers in the Western Bengal, combined with the comparatively low rainfall and red hard soil, makes density there lower than those of the eastern districts. The district of Howrah has the highest density not only in Western Bengal but in the whole of the Province. The district of Hooghly, too, has a high density. This is to be explained by the fact that, apart from their proximity to the city of Calcutta, Howrah and Hooghly lie in the region of the delta formed by almost all the important rivers of West Bengal, and, as such, the soil of these two districts are very fertile. They are at the same time suitable in other respects, *i.e.*, configuration and rainfall, for maintaining a large population. In general, population in West Bengal thins off as one proceeds westwards from the banks of the Hooghly river. All these go to prove the influence of rivers on the distribution of population.

7. *Fertility and Density.*—That other things remaining the same or nearly the same, fertility has a direct bearing on density can be seen from the following table:—

TABLE NO. 33. Relation between Fertility and Density

Divisions	Fertility (gross agricultural produce in rupees per acre)	Density
Dacca	... 57	935
Chittagong	... 57	584
Rajshahi	... 47	557
Presidency	... 43	566
Burdwan	... 43	618

The proportionately greater densities of the Burdwan and Presidency Divisions are to be accounted for by the facts that the former include the highly populated industrial areas of Howrah and the latter maintain a large population that is employed in the great city of Calcutta. Taking the districts, the correlation between fertility and density becomes still more apparent. This is evident from the diagram given in the next page. Fertility there is measured in terms of gross agricultural produce per acre, and the figures in the graph indicate the districts arranged in order of fertility. Thus,

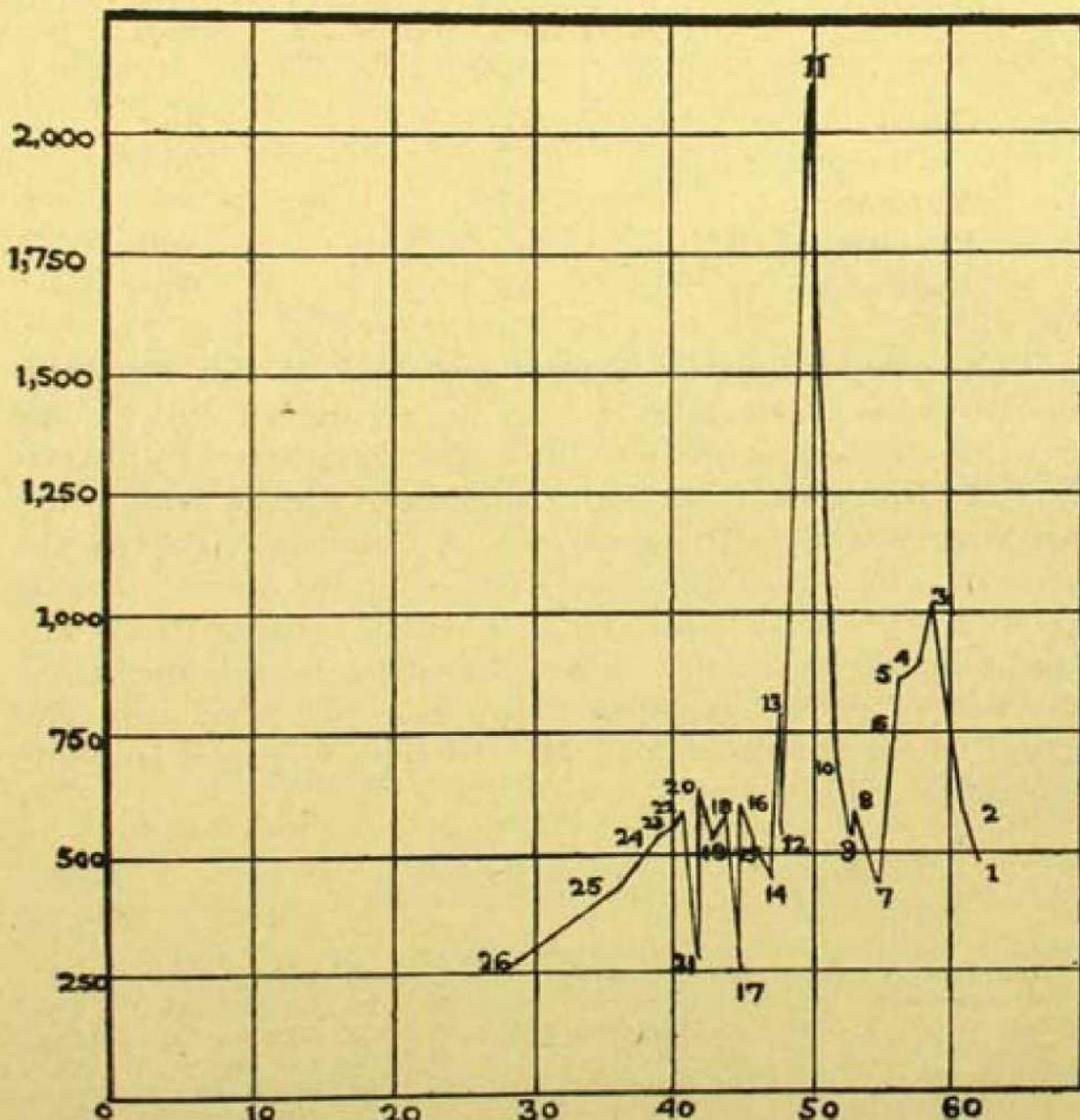
	Produce per acre Rs.		Produce per acre Rs.		Produce per acre Rs.
1. Rangpur	... 62	10. Hooghly	... 52	19. Nadia	... 43
2. Mymensingh	61	11. Howrah	50	20. Murshidabad	42
3. Dacca	59	12. Rajshahi	48	21. Khulna	42
3. Tippera	58	13. Bogra	48	22. Burdwan	41
5. Noakhali	57	14. Dinajpur	47	23. Birbhum	40
6. Faridpur	56	15. 24-Parganas	46	24. Midnapore	39
7. Chittagong	55	16. Malda	45	25. Bankura	36
8. Bakarganj	53	17. Jalpaiguri	45	26. Darjeeling	29
9. Pabna	53	18. Jessore	44		

The diagram shows a tendency of density being correlated to fertility. There are, no doubt, exceptions. But the

causes of the exceptions are to be found in the configuration and other factors mentioned before.

Diagram No. 7. Relation between Fertility and Density

Density per square mile



Fertility (measured by Gross Agricultural Produce, in rupees, per acre).
N.B. The figures in the graph indicate the districts arranged as stated above.

8. *Irrigation and Density.*—Another factor which influences the density of population is irrigation. Where

rainfall is deficient, irrigation is found to meet that deficiency, and the two combined help maintain a high density. In the Punjab, for example, Lyallpur was, in 1891, a barren tract with only 7 inhabitants per square mile. With the opening of the canals in 1901 the density had increased to 187 per square mile and in 1911 it went up to 272. So also in the East Coast South of Madras, which has a rainfall of only 32 inches, the density, as a result of canal irrigation, is almost the same as that in the West Coast with 110 inches of rainfall. Similarly, the facilities of canal irrigation existing in the Western Bengal have, to some extent, made up the deficiencies as regards rainfall. To this combination of irrigation with rainfall may be partly attributed the greater density of Burdwan Division than those of the Rajshahi and Presidency Divisions. The total areas irrigated from all sources in these three Divisions in the year 1939-40 were as follows:—

TABLE NO. 34. Area Irrigated in Burdwan, Rajshahi and Presidency Divisions, 1939-40¹²

District	Area irrigated (in acres)	Per cent. of area irrigated on total area
Burdwan	399,509	
Birbhum	256,172	
Bankura	416,321	
Midnapore	388,978	
Hooghly	69,340	
Howrah	5,860	
<i>Burdwan Division</i>	<u>1,476,180</u>	<i>16·2</i>
Rajshahi	19,300	
Jalpaiguri	149,600	
Darjeeling	53,950	
Malda	96,000	
Dinajpur	162,738	
Bogra	38,396	
Pabna	583	
<i>Rajshahi Division</i>	<u>520,567</u>	<i>4·1</i>
Nadia	478	
Murshidabad	166,894	
<i>Presidency Division</i>	<u>167,372</u>	<i>1·4</i>

¹² Cf. *Bengal Season & Crop Report, 1939-40*; and *Agricultural Statistics of Bengal, 1939-40*.

The area irrigated in the different Divisions, according to the Census of 1931, was:—

TABLE NO. 35. Percentage of Irrigated on Gross Cultivated Area, 1931

Division	Percentage
Burdwan	14·2
Presidency	2·0
Rajshahi	2·6
Dacca	0·6
Chittagong	0·4
 Bengal	 3·8

9. *Average Proximity and Acres per Person.*—Another way of looking at the density of population is to note the average proximity and acres for each person residing within the Province. If the population of Bengal were spaced evenly so that each person was at an equal distance from his nearest neighbour there would be, according to the Census of 1931, one person in 76·2 yards for the whole of the Province, or an average of 1·03 acre per person. A comparison may be made here between the average proximity and acre per person in Bengal and those in England and Wales. Thus,

TABLE NO. 36. Average Proximity in Yards and Acres per Person¹⁴

Locality and Year	Average proximity in yards	Acres per person	Persons per sq. mile
All Bengal :	1872 ...	92·1	1·571
	1921 ...	78·7	1·107
	1931 ...	76·2	1·039
England and Wales :	1871 ...	95·9	1·645
	1921 ...	74·2	0·986
	1931 ...	72·3	0·934

¹⁴ *Census Report of India, 1931, Vol. I, Part I, p. 36.*

Thus, the density of population was greater in Bengal than in England and Wales in 1871, and the average proximity in the latter was wider by 3·8 yards. By 1921, however, England and Wales developed a greater density than that of Bengal. Since 1921, the density has increased in both the countries, but the rate of increase in England and Wales has been greater than that in Bengal.

10. *Effective Pressure of Population on Land.*—We have so far discussed the number of persons to a given area of land, usually a square mile. But to indicate more accurately the pressure of population on land the net cropped area per head of population is a better index. For the whole of India, excluding the Native States, there were, in 1931, 2·9 acres of cropped land per agriculturist as against 2·7 acres in 1921.¹⁵ The cropped area in acres per cultivator in the different provinces as noted in the *Census Report of 1921* was as follows:—

TABLE NO. 37. Cropped Area per Cultivator in the Province

Province		Cropped area (in acres) per cultivator
Bombay	...	12·2
Punjab	...	9·2
Central Provinces and Berar	...	8·5
Madras	...	4·9
Bengal	...	3·1
Bihar and Orissa	...	3·1
Assam	...	3·0
United Provinces	...	2·5

¹⁵ *Ibid.*, p. 288.

Wattal has shown that the acreage per head of agricultural population in the British (administered) districts has decreased since the beginning of this century. Thus,

TABLE No. 38. Variation in the Acreage of Cropped Area per Head of Agricultural Population¹⁶

Year			Acreage per head of population supported by agriculture
1901	...	...	1.28
1911	...	...	1.24
1921	...	...	1.15
1931	...	...	1.20

Thus, as observed by Thomas Holderness, there is not more than an acre and a quarter per head of that part of population which is directly supported by agriculture.¹⁷ But an average holding of a little over an acre per head of the agricultural population is, according to the Central Banking Enquiry Committee, "inadequate to maintain an agricultural family in ordinary comfort in the conditions which exist in India at the present day."

The picture appears to be far more gloomy if the cultivated land per head of total population is taken into account. Taking the provinces only, their aggregate population, according to the Census of 1941, is 295,827,000 while the net area sown in 1940-41 was 214.0 million acres. This gives the all-India average of cultivated land per head of

¹⁶ Cf. Wattal, *Population Problem in India* (1934), p. 140.

¹⁷ Quoted by Wattal from Thomas Holderness' *Peoples and Problems of India*.

total population as barely 0·72 acres. So far as Bengal is concerned, the average stands thus:—

TABLE No. 39. Cropped Area per Head of Total Population in the Districts.

Districts	Net cropped area (in acres in 1939-40)	Population as per Census of 1931 (in thousands)	Cropped area per head of total population (in acres)
24-Parganas	910,500	2,714	0·33
Nadia	931,100	1,530	0·60
Murshidabad	858,700	1,371	0·62
Jessore	867,700	1,671	0·51
Khulna	833,600	1,626	0·51
Burdwan	585,000	1,576	0·37
Birbhum	617,300	948	0·65
Bankura	603,900	1,112	0·54
Midnapore	1,692,100	2,799	0·60
Hooghly	269,500	1,114	0·24
Howrah	87,800	1,099	0·08
Rajshahi	919,000	1,429	0·64
Dinajpur	1,200,800	1,755	0·69
Jalpaiguri	787,100	983	0·80
Darjeeling	185,600	320	0·57
Rangpur	1,746,700	2,595	0·67
Bogra	564,900	1,086	0·51
Pabna	348,000	1,446	0·24
Malda	436,500	1,054	0·41
Dacca	1,471,900	3,433	0·42
Mymensingh	2,551,400	5,130	0·49
Faridpur	1,434,200	2,362	0·60
Bakarganj	1,613,400	2,939	0·54
Chittagong	649,700	1,797	0·36
Tippera	1,171,200	3,110	0·37
Noakhali	741,500	1,707	0·43
Total*	24,713,100	48,706	0·50

* Excluding Chittagong Hill Tracts.

So, for the Province as a whole there is only 0·5 acre of cropped area per head of the total population. If, however, the population of 1941 is considered, the cropped area per head comes down to 0·41 acre. This is probably the lowest recorded in any agricultural or agricultural-cum-industrial country in the world, lower than even that of Japan where there is $\frac{1}{2}$ acre of arable land per head of population.¹⁸ The most distressing feature in Bengal is,

¹⁸ Gunther, *Inside Asia* (1934), p. 57.

however, that whereas the population has been increasing from decade to decade, the net cropped area has virtually remained unaltered. Thus,

TABLE NO. 40. Variations in the Acreage of Cropped Area and the Movement of Population

	1916-17	1936-37	1939-40	Percentage increase during the last 25 years
Net cultivated area actually cropped ...	24,753,410	24,466,300	24,916,400	0·6
Population ...	46·3 million (1911)	51·0 million (1931)	60·3 million (1941)	30·4

So, population has increased 50·6 times faster than the cropped area during the last 25 to 30 years.

11. *Urban and Rural Population.*—The excessive pressure of population on land in India generally, and particularly in Bengal, and the predominance of agriculture over industry can be seen also from the division of the population into urban and rural areas. The following table shows the movement of population as between towns and villages in India since 1921:—

TABLE NO. 41. Distribution of Population in Towns and Villages in India since 1921

	1921	1931	1941	Increase (+) or decrease (-) since 1921
No. of towns ...	2,316	2,575	2,703	+387
No. of villages ...	696,831	685,665	655,892	-40,939
No. of persons living in towns ...	32,475,276	38,985,427	49,696,053	+17,220,777
No. of persons living in villages ...	313,852,351	286,467,204	339,301,902	+25,449,551
Per cent. of urban population ...	10·2	11	12·8	+2·6
Per cent. of rural population ...	89·8	89	87·2	-2·6

It is true that during the last two Census decades the urban population has increased by 2·6 per cent., which indicates that the process of urbanisation, although very slow, is going on even in India. The same process is further indicated by the fact that during 1921-31 while the rural population increased by 9·6 per cent., the urban population increased by 20·0 per cent. None the less, India is still overwhelmingly rural in character with as many as 872 out of every 1,000 persons living in rural areas.

The distribution of urban and rural populations in different provinces of India is as follows:—

TABLE No. 42. Distribution of Urban and Rural Population in the Provinces (according to Census of 1931)

Province	Percentage		No. per mille residing in—	
	Urban	Rural	Town	Rural Massa
Assam	2·66	97·34	34·0	966·0
Bengal	7·35	92·65	73·0	927·0
Bihar and Orissa ...	4·39	95·61	41·0	959·0
Bombay*	22·40	77·60	209·0	791·0
Central Provinces and Berar	10·89	89·11	...	...
Madras	13·56	86·44	137·0	863·0
N. W. F. Province ...	15·92	84·08	82·5	917·5
Punjab	13·01	86·99	...	...
United Provinces ...	11·21	88·79	112·0	888·0

* Includes Sind but excludes Aden.

So, in urban and rural populations, Bengal ranked as seventh and third respectively among the nine provinces existing in 1931. The distribution of the urban and rural population in the districts of Bengal is noted below:—

TABLE NO. 43. Distribution of Urban and Rural Population in the Districts of Bengal, 1931

District	Percentage		No. per mille residing in—	
	Urban	Rural	Town	Rural Mauza
24-Parganas	15 to 25	85 to 75	199	801
Nadia	4 to 7·5	96 to 92·5	69	931
Murshidabad	4 to 7·5	96 to 92·5	67	933
Jessore	Less than 2	More than 98	12	988
Khulna	2·5	97·5	22	978
<i>Presidency Division</i>	19·7	80·3	197	803
Burdwan	8·2	91·8	82	918
Birbhum	2·5	97·5	22	978
Bankura	4 to 7·5	96 to 92·5	61	939
Midnapore	4 to 7·5	96 to 92·5	49	951
Hooghly	15 to 25	85 to 75	183	817
Howrah	15 to 25	85 to 75	232	768
<i>Burdwan Division</i>	9·4	90·6	94	906
Rajshahi	2·5 to 3	97·5 to 97	27	973
Dinajpur	Less than 2	More than 98	11	489
Jalpaiguri	Less than 2	More than 98	19	981
Darjeeling	13·6	86·4	136	864
Rangpur	2·5 to 3	97·5 to 97	25	975
Bogra	Less than 2	More than 98	18	982
Pabna	3·8	96·2	38	962
Malda	3·4	96·6	34	966
<i>Rajshahi Division</i>	2·8	97·2	28	972
Dacca	5·0	95	50	950
Mymensingh	2·5 to 3	97·5 to 97	27	973
Faridpur	2·5	97·5	21	979
Bakarganj	2·5	97·5	23	977
<i>Dacca Division</i>	3·1	96·9	31	969
Chittagong	3·2	69·8	24	976
Tippera	2·5	97·5	14	986
Noakhali	Less than 2	More than 98	32	968
Chittagong Hill Tracts		100		1,000
<i>Chittagong Division</i>	2·3	97·7	23	977
Cooch-Behar State	...	...	31	969
Tripura State	...	...	25	975
Calcutta	100	...	1,000	...
<i>Total Bengal (1931)</i>	7·3	92·7	73	927
<i>(1941)</i>	9·7	90·3	97	903

The urban population includes all persons living in towns and cities. A town has been defined for census pur-

poses to include all municipalities, all cantonments and all civil lines not falling within municipal limits. The definition also includes "any collection of continuous houses with a population not less than 5,000 persons", which may be treated as town for census purposes.¹⁹ The towns of Bengal included, in 1931, the following:—

Municipalities	...	...	123
Cantonments	...	...	3
Towns for census purposes	...	...	17
		Total	143

Of these, 23 towns in all belong to the smallest group, each having less than 5,000 inhabitants.

A census 'city' means every town containing not less than 100,000 inhabitants. There were only 3 such cities recorded in Bengal in 1931, viz., Calcutta, Howrah and Dacca. The 1941 census has added Bhatpara as the fourth.

Of 73 persons, out of every 1,000, living in urban areas, 42 per cent. were accounted for by the population of the three cities named above. Of the urban population, again, 73·1 per cent. lived in towns with a population of 20,000 and over and 17·3 per cent. in towns with a population of 10,000 to 20,000.

These figures go to show that excluding the big cities of Calcutta, Howrah and Dacca and the districts around them, more than nine-tenths of the population of every district live in villages. As a matter of fact, the truly urban population is mainly concentrated in and around the three cities. As much as 54 per cent. of the total urban population was found in the Presidency Division and 22 per cent. in the Burdwan Division. The Dacca Division had only 11·6 per cent. But the other two Divisions had in them a total of only 12·4 per cent. of the total urban population of the Province. Even of the total urban population, a large section can be called as such only by making a liberal use

¹⁹ Cf. *Census Report of Bengal, 1931*, p. 73.

of the term, since a considerable section of the urban area is not strictly urban as it is generally understood in the Western countries, but only enlarged and improved villages.

The proportion of urban population has varied very slowly. Thus, for every 1,000 rural population in the Province the number of town-dwellers in different census decades was as follows:—

TABLE NO. 44. No. of Town-Dwellers for every 1,000 Rural Population

Year		No. of town-dwellers per mille
1892	...	60
1901	...	65
1911	...	69
1921	...	73
1931	...	79
1941	...	97

It should be noted, however, that the increase in the urban population has been mostly at the cost of the smaller towns. In 1931, the cities absorbed 42 per cent. of the total urban population as against 38·1 per cent. in 1921. During the decade 1921-31 the cities gained a greater share of the proportion of population than towns of 20,000 to 50,000 or of 50,000 to 100,000 inhabitants. This can be seen from the table given below:—

TABLE NO. 45. Per cent. of Urban Population living in different Classes of Towns

		1921	1931
I. Cities (<i>i.e.</i> , towns having 100,000 or more citizens)	...	38·1	42·0
II. Towns having 50,000 to 100,000	...	—	5·3
III. Towns with 20,000 and 50,000	...	27·6	25·8
IV. Towns having 10,000 to 20,000	...	—	17·3
V. Town with 5,000 and 10,000	...	—	7·6
VI. Towns under 5,000	...	1·8	2·0

This distressing feature in the growth of urban population has maintained its continuity in the 1941 Census also. According to the report of Mr. M. W. W. Yeatts on the 1941 Census of India, the population of the cities with 100,000 inhabitants or more has increased by 81 per cent. in the whole of India. Yeatts has observed in this connection: "I think it is time that it was realised that India is for urbanisation on a big scale and that it will affect pronouncedly the really large town rather than the smaller ones". Again, "it is urbanisation, too, with all the drawbacks of lack of control, squatter's freedom and general squalor. It means that the approaches to every city of India are hideously defaced by brick fields, squatter's camps and general riff-raff of all kinds...." This is, indeed a timely warning. We must be careful enough not to allow our cities to grow to an unwieldy extent. There must be an even development of both the rural and urban conditions, and there should be smaller towns flourishing with trade and industry. Over-congestion in the cities must be avoided not only in the interest of the inhabitants thereof, but also for a balanced and regional development of the whole country.

None the less, it must be noted that taking the urban population as a whole, it is very small, being only 7·35 per cent., in Bengal, and the rural population constitutes as much as 92·65 per cent. Excepting Bihar, Orissa and Assam, all other major provinces of India are better placed than Bengal in this matter. But nowhere the proportion of rural population is less than 77 per cent. For India as a whole, the percentage runs as much as to 87·2 per cent.

Distribution of Urban and Rural Population in Other Countries.—Compared to the distribution of population as urban and rural in Bengal and other provinces of India, the proportion in some of the leading countries of the world can be noted below:—

TABLE No. 46. Distribution of Urban and Rural Population

Country				Percentage of distribution	
				Urban	Rural
England and Wales	...	...	...	80	20
U. S. A.	...	...	...	56·2	43·8
Canada	...	...	...	53·7	46·3
Northern Ireland	...	...	...	50·8	49·2
France	...	...	...	49	51

In 1801, less than 17 per cent. of the population of England and Wales lived in urban centres of 20,000 or more. In 1891, it was 53·5 per cent. At the present day, eight out of every ten Englishman dwell in towns of 10,000 and upwards, and "the interests and problems of the city have become the interests and problems of substantially the whole people".²⁰ While in France and Germany, the variations in the proportion of urban and rural population were as follows:—

TABLE No. 47. Percentage Variations in Urban and Rural Population in France and Germany²¹

	Year		Per cent. of	Per cent. of
			urban population	rural population
France :	1846	...	24·4	75·6
	1861	...	29·9	71·1
	1876	...	32·4	67·6
	1886	...	35·9	64·1
	1896	...	39·1	60·9
	1906	...	42·1	57·9
	1911	...	44·1	55·9
Germany :	1871	...	36·1	63·9
	1881	...	41·4	58·6
	1890	...	42·5	57·5
	1900	...	54·4	45·6
	1910	...	60·0	40·0

²⁰ Cf. Ogg and Sharp, *Economic Development of Modern Europe* (1932), p. 334.

²¹ Compiled from the figures given in Ogg and Sharp, *op. cit.*, p. 334, and Clapham, *Economic Development of France and Germany, 1814-1914*, pp. 59, 278.

Thus, in France, the urban population increased by 80·7 per cent. in sixty-five years, while in Germany the increase was by 66·2 per cent. in 39 years. The percentage of rural population fell considerably in both. In view of the increase of population in the intervening years this decline in the percentage of rural population is much more significant than is apparent. The fall in the population of rural areas and the corresponding increase in that of the urban areas were due to the ever increasing demand for labour in industries, the latter of which again, proved the growing importance of industries in the two countries during the years under review. As a matter of fact, the distribution of population in towns and villages is an index of industrial progress. The fact that Bengal, or for matter of that the whole of India, has a very low, possibly the lowest of all the important countries of the world, percentage of urban population is an unfailing indication of her industrial backwardness which has been the most characteristic feature of the Indian economic system since the middle of the last century. This will be observed in the next Section.

II. OCCUPATIONAL DISTRIBUTION OF POPULATION

Total Working Population.—As per Census of 1931, out of a total population of 50,114,002 only 14,414,422 were workers and the remainder, that is, 35,699,580 were non-working dependents. Taking the proportion for the whole of Bengal, there were 288 workers (of whom 13 were working dependents) in every 1,000 of the population, and the remainder dependents. That is, barely 28·8 per cent. of the population had employment in some form or other and the rest was constituted of the non-working dependents and the non-employed. Excluding the working dependents, the percentage as earners would come down to 27·5 per cent.²²

²² *Census Report of Bengal, 1931*, p. 255.

Occupational Distinction.—Now, of those employed in Bengal, the percentages distributed over different occupational sub-classes and the corresponding figures for the whole of India as also for a few important countries of the world are noted in the following table:—

TABLE No. 48. Occupational Distribution of Population²³

Occupation	Bengal (1931)	India (1931)		Great Britain (1931)		U.S.A. (1930)		Germany (1925)		France (1926)		Japan (1930)		Canada		
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	
Agriculture, Fish-ing, etc. ...	22.3	68.34	29.4	67.2	3.2	7.1	8.8	22.0	15.4	30.5	20.1	38.3	22.8	50.3	11.8	31.2
Industry, Mining and Quarries ...	2.8	9.09	4.4	10.2	21.2	47.2	12.6	31.7	20.9	41.3	8.3	16.4	5.5	6.1	2.8	5.7
Trade and Trans-port ...	2.7	8.36	2.9	6.6	9.3	20.7	9.7	24.5	8.3	16.4	8.9	17.0	9.1	20.2	6.7	17.7
Public Adminis-tration & Libe-ral Profession ...	0.8	1.95	1.0	2.7	4.6	10.3	3.7	9.2	3.5	6.1	3.1	5.8	...	...	3.4	9.1
Others ...	3.5	11.91	6.1	13.3	6.5	14.7	5.0	12.6	2.8	5.7	2.9	5.6	1.3	3.0	6.4	17.2
Total ...	32.2	100.0	43.8	100.0	44.8	100.0	39.8	100.0	30.9	100.0	43.3	...	36.7	...	31.1	...

* The columns marked I and II represent the percentages of the employed on the total and working populations respectively.

† The figure excludes those who follow agriculture as subsidiary to some other occupation.

‡ Figures for all countries except Bengal and India are taken from Visvesvaraya's *Planned Economy for India*.

§ Figures for all countries except Bengal and India are taken from Visvesvaraya's *Planned Economy for India*.

Thus, out of the total population of Bengal, 22.3 and 2.8 per cents. were employed, in 1931, in agriculture and industry respectively as compared to 3.2 and 21.2 per cents. in Great Britain. Of the working population, however, Bengal had as much as 68.34 per cent. in agriculture and 9.09 per cent. in industry, etc., while Great Britain had at the same period only 7.1 per cent. in agriculture and as much as 47.2 per cent. in industry. The proportion engaged in agriculture as principal occupation throughout India was 67.2 per cent. But it would rise up to 71 per cent. if the number of those who worked in agriculture as subsidiary to some other occupation was also included. The proportions have been very little altered in the Census of 1941. The point to be noted, however, is not simply that, of all the leading countries, India has had the highest percentage engaged in agriculture, but that percentage is progressively on the increase since 1881. Even as late as the middle of the last century we had an even balance between agriculture and industry. But as the result of a most selfish policy adopted and pursued by Great Britain in regard to the trade and industry of India ever since the establishment of her sovereignty over here that balance has been lost resulting in the progressive ruralisation of the country. This is evident from the increase in the percentage of population occupied in agriculture from decade to decade as given below:—

TABLE NO. 49. Percentage Variation of Working Population engaged in Agriculture

Year			Per cent. of working population employed in agriculture
1881	...	...	58
1891	...	...	61
1901	...	...	66
1921	...	...	72.4
1931	...	...	70

The fall in 1931 was not real. It was due to the result of a different system of census classification adopted in the Census of 1931. Dr. Hutton thinks that the decrease was 'apparent rather than real', and that the change was due to the number of females, 572 per 10,000, who returned their occupation as domestic service. According to Wattal, the proportion was stationary at 72 per cent. in 1931.²¹

As contrasted with the case in India, the tendency in almost all the important countries has been quite the contrary. The percentage of persons employed in agriculture has fallen in each of these countries since the middle of the last century, and even between 1911 and 1931 it declined as noted below:—

TABLE No. 50. Percentage Variation of Population engaged in Agriculture in some leading Countries²²

Country	Per cent. of working population engaged in agriculture	
	1911	1931
Italy	...	55
France	...	40
Germany	...	31
Japan	...	55

The decline in the percentage of population engaged in agriculture was due to the increase in the percentage employed in the rising industries of each country. Germany, for instance, at the beginning of the nineteenth century was rather more preponderantly agricultural than even France. In 1804, as high as 73 per cent. of her popu-

²¹ Wattal, *op. cit.*, p. 140.

²² Taken from an article on "Agricultural Reorganisation in India" by Dr. R. K. Das published in *Modern Review* of May, 1941.

lation was rural, and taking Germany as a whole the proportion of population engaged in agriculture was not less than 80 per cent. By 1914, however, that proportion fell to less than 30 per cent., whereas that engaged in industry was 42 per cent. and the proportion employed in trade and miscellaneous professions was more than 27 per cent.²⁶

The preponderance of agriculture in this Province can also be seen from the actual number of persons employed in agriculture as compared with those in other occupations. Thus,

TABLE NO. 51. Distribution of the Working Population (Principal Earners) of Bengal (1931)²⁷

Occupation	Males	Females	Total following as principal occupation	Total following occupation	Per cent. of total population
Agriculture and Pasture ...	8,638,122	749,490	9,387,612	10,975,264	21·9
Fishing and Hunting ...	159,221	26,176	185,397	218,029	0·4
Industry ...	970,102	263,898	1,234,000	1,382,985	2·8
Mining ...	25,157	17,464	42,621	44,593	
Transport ...	264,249	12,171	276,420	313,354	0·6
Trade ...	774,062	135,247	909,309	1,066,443	2·1
Public Administration & Liberal Arts ...	363,293	19,977	383,270	444,301	0·8
Miscellaneous ...	1,022,510	315,485	1,337,995	1,787,521	3·5
Total ...	12,216,716	1,539,908	13,756,624	16,232,490	30·1

The Table shows the distribution of both the population engaged as principal earners and those who are either principal or subsidiary workers as well as working dependents. Of the total engaged in different occupations, as many as 11 million or about 68·8 per cent. were, in 1931, engaged in agriculture.

²⁶ Ogg and Sharp, *op. cit.*, p. 192.

²⁷ Compiled from the *Census Report of India*, 1931, Vol. I, Part V.

While the following table would show the distribution of principal earners and working dependents, *i.e.*, excluding those who followed as subsidiary occupations only:—

TABLE No. 52. Distribution of Workers (Earners and Working Dependents) in Bengal, 1931²⁵

Occupations	Males	Females	Both sexes	Per cent. on all persons occupied	
				1931	1921
Agriculture & Pasture }					
Fishing & Hunting }	9,030,155	826,306	9,856,461	68·34	71·92
Industry ...	982,182	286,891	1,269,073	8·80	10·00
Mining ...	25,388	17,686	43,074	0·29	0·41
Transport ...	266,466	12,465	278,931	1·93	2·22
Trade ...	783,933	144,169	928,102	6·43	5·91
Public Administration & Liberal Arts ...	308,646	20,973	329,619	2·30	1·81
Miscellaneous ...	1,125,443	589,758	1,715,201	11·91	7·73
Total ...	12,522,213	1,898,248	14,420,461	100·00	100·00

According to the Census of 1931, in the whole of the Province there were nearly 25 persons following an agricultural occupation for every one employed in government service or in the professions and liberal arts. The proportion was in general lowest in districts of Chittagong and Presidency Divisions and highest in those of Rajshahi Division.

As compared to Bengal, however, Bombay, the premier industrial province in India, has a better record. In Bengal, of the total population, 21·9 per cent. were employed in agriculture in 1931 while only 2·8 per cent. in industry. In Bombay, the corresponding figures were 23·9 and 4·6 per cents. The relative positions of the different provinces can be noted from the following table showing the numbers of the employed in different classes of occupation out of every 1,000 employed persons:—

²⁵ *Census Report of Bengal, 1931*, p. 261.

TABLE No. 53. Occupational Distribution in the Provinces (1931)²⁹

Occupations	Assam	Bengal	Bihar & Orissa	Bombay	Central Provinces	Punjab	Madras	United Provinces
I. Exploitation of animals and vegetation ...	814	680	747	676	800	634	462	745
II. Exploitation of minerals ...	4	2	8	1	2	1	1	..
III. Industry ...	83	88	83	113	83	170	88	117
IV. Transport ...	17	20	9	20	12	21	13	9
V. Trade ...	38	68	44	51	44	60	42	51
VI. Public Administration and Liberal Arts ...	18	28	17	39	20	41	22	20
VII. Others ...	26	114	92	100	39	73	372	58
Total ...	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

It would be interesting to compare the actual number of persons employed in different occupations in Bengal, as given above, with the number so employed in Great Britain about the same time. Thus:—

TABLE No. 54. Occupations of the People in Great Britain (1931)³⁰

Occupations	Males	Females	Total	Per cent. of occupied on total population
Agriculture	1,281,583	71,429	1,353,012	4·1
Fishing	45,417	82	45,499	
Industries	4,689,269	1,744,514	6,433,783	22·3
Mining, Quarries, etc.	1,115,258	5,035	1,120,293	
Transport	1,748,024	82,207	1,830,231	5·4
Business organisation	1,618,054	700,748	2,318,802	6·8
Services	2,640,263	2,615,706	5,255,969	15·6
Other workers	1,631,783	243,254	1,875,037	5·6
Retired or not gainfully occupied	1,551,553	12,055,297	13,606,850	40·2
Total	16,321,204	17,518,272	33,839,476	100·0

²⁹ Compiled from the *Census Report of Bengal, 1931*.

³⁰ The figures are taken from *The Whitaker's Almanack, 1937*, and the percentages are worked out on the basis of those figures.

Thus, nearly 60 per cent. of the total population of Great Britain were gainfully occupied in 1931, while in Bengal only a little over 30 per cent. of her population were occupied in some kind of occupation or other in the same year. The total numbers following agriculture and industry in Great Britain were 1,353,612 and 6,433,783 respectively as compared to 9,387,612 and 1,234,000 in Bengal.

III. PROBLEMS OF POPULATION

The main features of the Indian population problem, including those of the problem of Bengal, can be classified under the following principal heads:—

- (1) high death-rate;
- (2) high birth-rate;
- (3) high infantile and puerperal mortality;
- (4) high maternal mortality;
- (5) absence of balance in the economic life resulting in intense pressure of population on land;
- (6) appalling poverty and low income *per capita*;
- (7) want of proper nourishment and inadequacy of public health services, and
- (8) illiteracy.

All these are clear symptoms of over-population, that is, excess of population relatively to the food-supply or rather the National Dividend. Whether or not Bengal, or for matter of that the whole of India, is actually over-populated we shall see in a later Section of this Chapter. Here we would discuss the principal features of our population problem, which connot fail to attract the attention of even a casual observer.

(1) DEATH-RATE

The most serious of India's present day population problems is the very high annual death-rate. The death-rates per 1,000 of the same sex and age reported at different Census decades are noted in the following table:—

POPULATION

127

 TABLE No. 55. Death Rate per 1,000 of the Same
Sex and Age³¹

Age	BENGAL						INDIA						
	Males			Females			Males			Females			
1891	1901	1911	1921	1891	1901	1911	1921	1891	1901	1911	1921	1931	
0	28.82	29.89	29.86	...	24.96	25.36	26.05	29.76	...	23.36	27.26	28.54	29.00
10	1.22	1.49	1.42	...	1.04	1.39	1.71	1.44	...	1.07	1.14	1.24	1.25
20	1.56	1.75	1.82	...	1.38	2.01	2.11	1.92	...	2.01	1.39	1.43	1.69
30	2.32	2.42	2.34	...	2.41	2.50	2.74	2.36	...	3.00	2.04	2.02	2.37
40	3.16	3.12	3.24	...	3.65	3.01	2.72	3.16	...	3.88	2.85	3.01	3.24
50	4.30	3.97	4.38	...	4.81	3.65	3.28	4.20	...	4.60	3.98	4.30	4.28
60	6.21	5.97	6.30	...	6.17	5.27	5.12	6.09	...	5.46	5.93	6.25	6.00

³¹ Compiled from the Actuarial Report to the Census Report of India, 1931, Table XXIX-XXX.



As compared to the death-rates in Bengal and India the death-rates in England have been as noted below:—

TABLE No. 56. Death-Rate per 1,000 in England²²

Age	Males		Females	
	1911	1921	1911	1921
0	12.04	9.00	9.77	6.94
10	0.19	0.18	0.20	0.18
20	0.35	0.35	0.29	0.31
30	0.48	0.43	0.41	0.39
40	0.81	0.69	0.66	0.53
50	1.48	1.88	1.14	0.92
60	3.04	2.56	2.31	1.90

Taking the mortality figures of England for the year 1921 as 100, the corresponding figures for India can be expressed as follows:—

TABLE No. 57. Comparison (Per Cent.) of India's Mortality with that of England (England = 100)

Age	0	10	20	30	40	50	60
Males	...	670	405	480	480	460	240
Females	...	860	550	540	610	470	300

Thus, it will be seen that death-rates in India are more than six times those of England for the Males and more than eight times those for the Females of the same age groups.

The danger, however, lies not so much in a very high death-rate for a specified year or even for a decade, as in the most obstinate persistence of that rate through decades together. In fact, whereas in almost all the progressive countries of the world death-rates have been falling appreciably since the eighties of the last century, in India the

²² *Ibid.*, pp. 44-5.

facts have been otherwise. The following table would show the movement of death-rates in this country:—

TABLE No. 58. Movement of the Death-Rates in India and Bengal²³

Year	Death-rate per mille		Year	Death-rate per mille	
	Bengal	India		Bengal	India
1885	...	26.37	1910	...	33.20
1886	...	25.51	1911	...	32.01
1887	...	22.88	1912	...	29.71
1888	...	25.92	1913	...	28.72
1889	...	28.21	1914	...	30.00
1890	...	30.15	1915	...	29.94
1891	...	28.52	1916	...	29.10
1892	...	32.49	1917	...	32.72
1893	...	25.75	1918	...	62.46
1894	...	33.97	1919	...	35.87
1895	...	28.94	1920	...	30.84
1896	...	32.04	1921	...	30.1
1897	...	36.03	1922	...	25.0
1898	...	26.61	1923	...	25.1
1899	...	29.94	1924	...	25.3
1900	...	38.60	1925	...	24.2
1901	...	29.46	1926	...	23.9
1902	...	31.49	1927	...	24.5
1903	...	34.70	1928	...	24.3
1904	...	32.86	1929	...	22.3
1905	...	35.96	1930	...	21.1
1906	...	34.73	1931	...	24.90
1907	...	37.18	1940	...	22.3
1908	...	38.21	1941	...	23.7
1909	...	30.91			22.0

In the course of about half-a-century (1885-1941), the death-rate has fallen by only a little more than 4 per mille.

But the movement of death-rate in England since 1850 has been as follows:—

TABLE No. 59. Movement of Death-Rate in England²⁴

Year	Death-rate per mille	Year	Death-rate per mille
1851-55	22.7	1931	12.4
1855	19.4	1932	12.0
1919	13.8	1933 (June 30)	10.8

²³ Compiled from the figures given in *The Population Problem of India* by Wattal, *The Bengal Public Health Report*, 1941, *The Census Report of India*, 1931, and *The Census Report of Bengal*, 1931.

²⁴ Cf. Wattal, *op. cit.*, p. 55.



So, in the course of about 80 years the death-rate in England fell by about 12 per thousand of total population. And, in most countries of Western Europe the death-rate recorded a considerable fall between 1870-80 and 1901-10. Thus,

TABLE No. 60. Decline of Death-Rate in Western Europe during 1870-80 and 1901-10³⁵

Country or State	Fall in death-rate per 1,000 of total population	Country or State	Fall in death-rate per 1,000 of total population
England and Wales	6·0	Prussia	... 8·2
Belgium	... 6·4	Austria	... 8·2
Denmark	... 5·2	Bavaria	... 9·2
Italy	... 2·6	Finland	... 4·0
Switzerland	... 2·3	Norway	... 2·8
Hamburg	... 11·5	Sweden	... 3·4

But during the same period, that is, between 1880 and 1910, the death-rate in India increased from 26·37 to 33·20 or by about 7 per 1,000 of total population. The fall in the death-rates of almost all the countries continued up to the World War No. 1. In Germany, for instance, the rate was 16·2 per thousand in 1910 as compared to 26·8 in 1841-50 and 20·8 in 1895-1904.³⁶ The actual average of death-rates for 10 years, 1895-1904, in the countries of Western Europe as compared to that in India is noted below:—

TABLE No. 61. Death-Rate per 1,000 of Total Population (Average of 10 years ending 1904)³⁷

Country	Death-rate	Country	Death-rate
England	... 17·2	Spain	... 27·8
Scotland	... 17·3	Austria	... 24·0
Ireland	... 18·0	Holland	... 17·0
Germany	... 20·8	Belgium	... 17·8
France	... 20·4	Denmark	... 15·8
Italy	... 22·7	Norway	... 15·1
Sweden	... 15·8	India	... 35·1

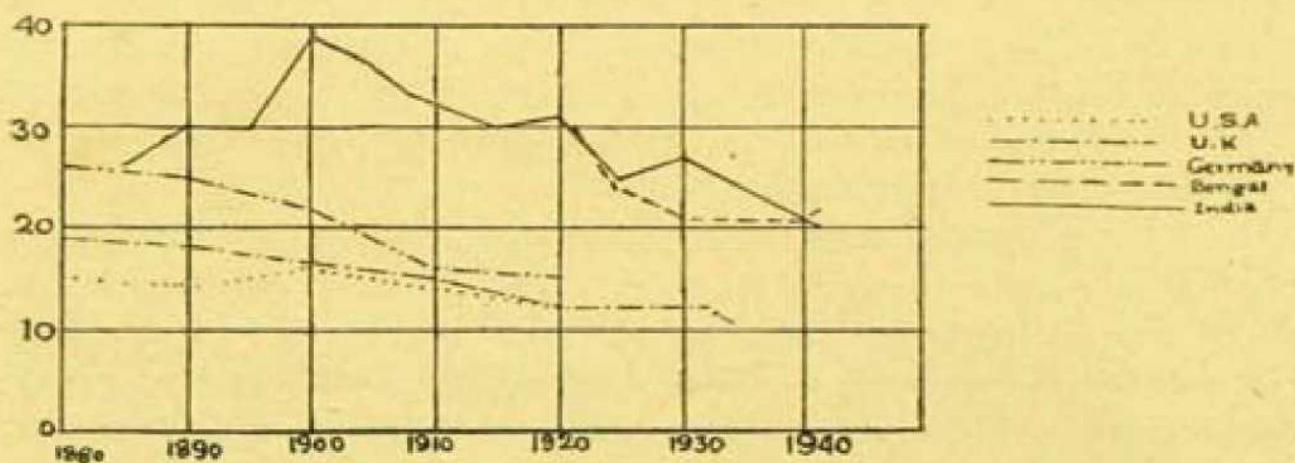
³⁵ Taken from Table XXVII of the Actuarial Report to the Census Report of India, 1931, Vol. I, Part I.

³⁶ Cf. Ogg and Sharp, *op. cit.*, p. 332.

³⁷ *Ibid.*

We give below a graphical representation of the movement of the death-rates in Bengal and India as compared to that of the death-rates in three leading countries of the world, viz., United States, United Kingdom and Germany. Thus,

Diagram No. 8. Movement of Death-Rates in some leading Countries



N.B.—The death-rates in each of the countries recorded as between 1910-20 a very sharp rise due to the World War and the subsequent influenza epidemic. This increase is not shown in the graphs.

The figures leave no doubt as to where we stand as regards the annual toll of the much valuable human life. Even small countries like Switzerland and Sweden had, in 1941, deaths of only 11·1 and 11·2 respectively per thousand of total population.³⁸ But Bengal, in the same year, recorded a death-rate of 23·7 per thousand. So far as death-rate is concerned, we in this country, are still wallowing in that stage in which Europe had been throughout the Middle Ages and in earlier modern-times when death-rate was very high there; and the same reasons which then caused high death-rate in Europe are mostly found to underlie the high rates in our country today, viz., scarcity of food, famine, pestilence, unsanitary conditions of living in both country and town, and the extra-ordinarily high rate of infant mortality.³⁹

³⁸ League of Nations Monthly Bulletin of Statistics, May, 1942.
³⁹ Ogg and Sharp, *op. cit.*, p. 330.

Death-Rate and National Dividend.—Death-rate bears a direct testimony to the relation existing between the number of population and the food-supply or rather the National Dividend. Death-rate varies directly with the surplus of population relative to the National Dividend, and inversely as the National Dividend or the *per capita* income. High death-rate in India is but an inevitable consequence of the very low income *per capita*. On the other hand, low death-rates in all the progressive countries show a higher income per head in each of these countries. The *per capita* income in India and in other important countries are noted below.

There is, of course, no unanimity of figures regarding the *per capita* income of the Indians as estimated by different authorities. Indeed, in view of the very imperfect nature of the existing statistical data, it is difficult to reach unanimity. Moreover, the attempts of the non-Indians to show a high average of our *per capita* income in order to prove the beneficence of foreign rule have greatly added to the confusion. Be that as it may, there is seldom any difference of opinion regarding the fact that the average income per head in India is the lowest among the progressive nations of the world. This can be seen from the following table:—

TABLE No. 62. Comparative Income *per Capita*
in different Countries⁴⁰

Country	Income <i>per capita</i> (in rupees)		
	Agriculture	Industries	Total
United States	175	721	896
Canada	213	470	683
United Kingdom	62	412	474
Sweden	129	384	513
Japan	57	158	215
India	59	12	71

⁴⁰ Cf. Visvesvaraya, *op. cit.*, p. 55.

Late Lord Stamp estimated that the income per head per annum in different countries in 1914 was as follows:—

TABLE NO. 63. Lord Stamp's Estimate of *per Capita* Income¹¹

Country	Income (£)	Country	Income (£)
United States	... 72	Germany	... 30
Australia	... 54	Japan	... 6
United Kingdom	... 50	India	... 3
France	... 38		

Thus, India occupies the last place in both the tables.

Estimates of the 'per capita' Income in India.—The various estimates of our income per head per annum are as follows:—

TABLE NO. 64. Various Estimates of the *Per Capita* Income in India¹²

		Rs.
1. Dadabhai Naoroji (1867-70)	...	20
2. Earl Cromer (the Major Evelyn Baring) and Sir (then Mr.) David Barbour (1882)	...	27
3. Lord Cromer (1900)	...	30
4. Digby (1898-99)	...	12½ to 17¼
5. Official Statisticians	...	30
6. Wadia and Joshi (1913-14)	...	44½
7. Shah and Khambata : 1920-22	...	37
	1914-22	58½
	1921-22	74
8. Findlay Shirras :	1921	107
	1922	116
9. V. K. R. V. Rao :	1925-29	78
	1931-32	62*
10. Unofficial Estimates :	1938-39	66
	1942-43	42

So, the estimates vary widely and the *per capita* income shows a progressive increase since 1867-70. But how much of this increase is due to the different methods of computation adopted by different authorities and how much of it is due to a real increase in the income, it is not clear. None the less, barring the figures for War-years of 1942-43, the

¹¹ Stamp, *Wealth and Income of the Chief Powers* (London), 1919.

¹² Cf. Dr. N. Das, *Industrial Planning: Why and How*, and also *Mysore Economic Journal*, Vol. 30, No. 3, pp. 46-7.

* With a margin of error of ±6 per cent.

figures represent in general a much lower record as compared to those of the advanced countries of the world. This difference is generally reflected in the very high rate of deaths in India even in normal times. The relative capacities of India and of other progressive countries to withstand the heavy pressure of an emergency also brings out in clear relief the relative differences in the national dividend. Indeed, the fact that Britain, even after making an average expenditure varying from 9 to 16 million pounds (£) per day for purposes of war during the first four and a half years of the World War No. 2, did not see any trace of famine, whereas India, with an average daily expenditure of relatively a small sum of nearly £150,000 during the same period, was visited, in certain parts, by some of the worst famines of human history, go to prove that the masses in India normally live in a hand-to-mouth state and have scarcely any margin over subsistence-level to support them in times of emergencies.

The poverty of India can be realised also from a study of the comparative revenues of the leading countries of the world. The figures include national, state and local revenues. Thus,

TABLE NO. 65. Revenues of the Leading Countries of the World

Countries	Revenues (in £ million)* 1928-29	Population (in millions)	Revenue per head of population (£)
U. S. A.	... 1,987·67	125·00	16
United Kingdom	... 876·00	44·35	19·7
Germany	... 458·00	65·75	6·9
France	... 430·27	42·00	10·2
India*	... 201·00	271·52†	0·7

* Gross Government revenue of British India including Provinces and local government institutions.

† Only of the Provinces.

** The figures for U. K. do not include State Revenue, those for Germany do not include State and Local Revenues, and those of France, not State Revenue. The figures for the U. S. A., Germany and France are converted into £ sterling according to the Par of Exchange prevailing on September 20, 1931.

The respective positions of the different countries in the above table and in Diagram No. 8 given earlier in p. 131 are an interesting study. They actually show that the high death-rate is correlated to a low income *per Capita* and *vice-versa*.

(2) BIRTH-RATE

High death-rate is not the only symptom of over-population and poverty in India. High death-rate as a general rule follows high birth-rate, and the latter is generally taken to be a sign of poverty. Thus, it has been stated: "In circumstances of ease the birth-rate tends to fall: in circumstances of hardship the birth-rate tends to rise."⁴⁴ Again, it has been observed by Thomas Doubleday that "the state of depletion or the deplethoric state is favourable to fertility, and that, on the other hand, the plethoric state or the state of repletion, is unfavourable to fertility in the ratio of the intensity of each state." It is among the poorer classes of people having generally undeveloped mind and with no or little scope for recreation and leisure that the birth-rate is seen to be comparatively higher. That is, poverty bars the way to mental upliftment and the sublimation of the sexual instincts. "In European countries and American where most investigation has been carried out it has been found that (a) birth-rate is negatively correlated with wealth, and (b) the indirect psychological and social effect of relative poverty, as contrasted with relative wealth, express themselves definitely and clearly in the sexual activity of human beings and through sexual activity in birth-rates."⁴⁵ The proof of this fact is found in the comparatively low birth-rate in the richer countries like England and France. The proof is also found in the comparative

⁴⁴ Quoted in the *Census Report of Bengal*, 1931, from H. Sutherland, *Proceedings of the World Population Conference*, 1927, p. 58.

⁴⁵ Raymond Pearl, *Biology of Population Growth*, 1926, quoted in the *Census Report of Bengal*, 1931.

birth-rates of differing income groups in the same country. Thus,

TABLE No. 66. Birth-Rate in different Countries.

Countries	Birth-rate ^{**}		(Pre-1914) Income per head per year in £ sterling ^{††}
	Quinquennial (1926-30) rate	Annual rate	
Sweden	15.9	14.8	Over 150
England and Wales	16.7	15.8	" 300
France	18.2	17.4	" 300
Germany	18.4	16.0	" 200
United States	19.7	17.8	" 400
Hungary	26.0	23.7	" 100
Italy	26.0	24.9	" 100
Spain	28.5	27.4	" 100
Portugal	31.9	30.4	"
Japan	33.4	32.2	" 40
British India	35.7	34.3	Under 30

The table shows the correlation existing between higher birth-rate and low income per head. The first five countries in the table have been ranked as low-birth countries, and the *per capita* income in each of those countries is above £150. The remaining are ranked as high birth-rate countries, and they are low-income countries too. India with the highest birth-rate has the lowest income per head per annum.

Birth-rate is, again, inversely correlated with the social status, that is, with the standard of living. This is true not only of different countries having different standards of living, but, as has already been said, also of persons of different social status in the same country. Thus, the number of births in the year 1911 per 1,000 married men under 55 years of age in England and Wales grouped

** Cf. Wattal, *op. cit.*, pp. 52-3.

†† Cole, *Intelligent Men's Guide Through World Chaos*, p. 436.

according to the occupation of the father was, as given by Carr Saunders, the following:—

TABLE NO. 67. Births among different Occupational Groups in England^{**}

Occupation of the father	No. of births per mille
Upper and middle classes ...	119
Intermediate	132
Skilled workmen ...	153
Intermediate	158
Unskilled workmen ...	213

The intimate relation existing between fertility and economic or social status has been further explained by Doubleday. According to him, whenever the existence of a species is endangered "a corresponding effort is invariably made by nature for its preservation and continuance by an increase of fertility, and that this especially takes place whenever such danger arises from a diminution of proper nourishment or food. . . ."

Thus, high birth-rates and high death-rates are symptoms of population outrunning food-supply or the command over food-supply, *i.e.*, the National Dividend. High birth-rate is, therefore, invariably followed by a high death-rate even though, as observed by Doubleday, it itself follows high death-rate. High death-rate is due mainly to under-nourishment. Therefore, to lower the birth-rate means, even if other things remain the same, that is, the command over food-supply is constant, an increase in the *per capita*

^{**} Taken from the Actuarial Report to the *Census Report of India*, 1931, Vol. I, Part I, p. 144.

income and *pro tanto* increase in the *per capita* command over food-supply and other necessities of life, and a lowering of the death-rate thereby. Indeed, the statistics relating to most countries of Western Europe confirm the view that the fall in the birth-rate synchronises with a fall in the death-rate. After 1870-75, "there set in that pronounced and almost universal decline of the birth-rate." But the fact that inspite of this there was a "very substantial growth" was due to the continuing fall in the death-rate.⁴⁹ In Germany, for example, the birth-rate fell by 33 per cent. during the period 1876-1911; but the fall was more than compensated by a steady decline of the death-rate. The following figures taken from the Actuarial Report to the *Indian Census Report, 1931*, give an idea of the comparative variations of death-rate and birth-rate in the European countries:—

TABLE No. 68. Fall in the Death-rate and Birth-rate between 1871-80 and 1901-10 in certain States of Europe (points per 1,000 of the population)

Country	Fall in the—		Country	Fall in the—	
	Death-rate	Birth-rate		Death-rate	Birth-rate
Hamburg ..	11·5	12·2	Prussia ..	8·2	5·5
Wartenburg ..	11·3	10·3	Austria ..	8·2	4·3
Saxony ..	10·8	10·8	Hesse ..	8·0	5·9
Bavaria ..	9·2	5·9	Alsace-Lorraine ..	7·9	5·4
Netherlands ..	9·2	5·7	Belgium ..	6·4	6·2
Baden ..	8·3	5·8	England and ..		
Denmark ..	5·2	2·8	Wales ..	6·0	8·2
Scotland ..	5·0	6·5	Norway ..	2·8	3·6
Finland ..	4·0	5·8	Italy ..	2·6	2·3
Sweden ..	3·4	4·7	Switzerland ..	2·3	3·8

⁴⁹ Cf. Ogg and Sharp, *op. cit.*, p. 331.

The actual trend of birth-rate between 1841 and 1905 is indicated in the following table:—

TABLE NO. 69. Birth-rate per 1,000 of Total Population⁵⁰

Country	1841-50	1861-70	1871-75	1900-05
England	34·6	36·0	36·0	29·0
Scotland	...	34·8	35·0	29·7
Ireland	...	26·1	26·4	23·2
Germany	36·1	37·2	38·9	35·5
France	27·3	26·3	25·5	21·7
Italy	...	37·5	36·9	33·5
Spain	...	37·8	36·5	34·8
Austria	35·9	35·7	37·2	34·2
Holland	33·0	35·3	36·1	32·1
Belgium	30·5	31·6	32·4	28·5
Denmark	30·5	31·0	30·8	29·7
Norway	30·7	30·9	30·3	29·7
Sweden	31·1	31·4	30·7	26·7

Compared with the reduction of birth-rates in important countries of Europe, the birth-rate in India has changed very little in the course of the last fifty years. Thus,

TABLE NO. 70. Quinquennial Average of Birth-Rate in India (Per 1,000 of total population)

Year	Birth-rate	Year	Birth-rate
1885	36·74	1911-15	38·66
1886-90	34·23	1916-20	35·00
1891-95	36·62	1921-25	33·65
1896-1900	38·58	1926-30	35·65
1901-05	37·88	1931	34·30
1906-10	38·66	1940	33·00

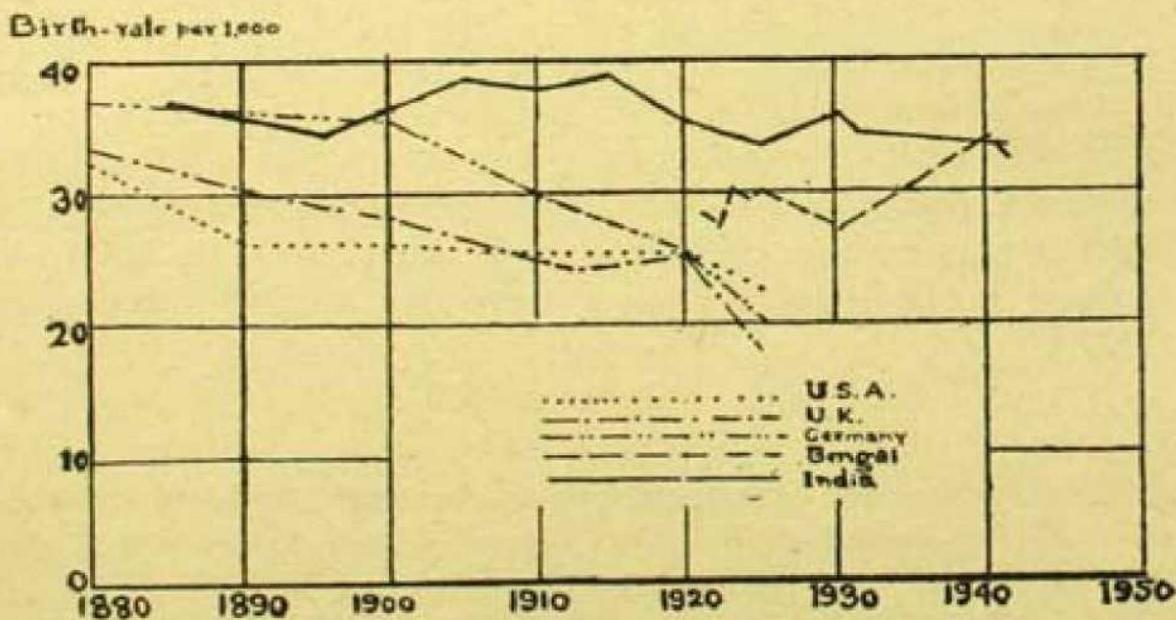
⁵⁰ *Ibid.*

Thus, in course of five and a half decades the birth-rate in India has gone down only by a little over 3·5 per thousand. Even then there is no certainty that this downward course would be maintained, since earlier contractions, as will be seen, have been followed by expansions of the rate.

The comparative birth-rates in India and in certain leading countries is shown below graphically:—

Diagram No. 9

Comparison of Birth-Rates in India and in certain leading countries



The variations of birth-rates and death-rates in Bengal per 1,000 of total population since 1921 can be seen from the table given in the next page. In course of the two decades under review while there was a welcome fall in the death-rate from 31·1 to 23·7 per 1,000, the rate of birth increased from 27·9 to 31·9 per 1,000.

TABLE NO. 71. Variations in Birth-rates and Death-Rates in Bengal per 1,000 of Total Population⁵¹

Year		Birth-rate	Death-rate	Rate of survival
1921	...	27.9	31.1	3.2
1922	...	27.4	25.1	2.3
1923	...	29.9	25.4	4.5
1924	...	29.4	25.7	3.7
1925	...	29.6	24.8	4.8
1926	...	27.4	24.7	2.7
1927	...	27.7	25.5	2.5
1928	...	29.5	25.5	4.0
1929	...	29.2	23.5	5.7
1930	...	26.6	22.4	4.2
1941	...	31.9	23.7	8.2

The average birth-rate and death-rate per mille during the decade 1921-30 in Bengal were 28.5 and 25.0 respectively as compared with 36.3 and 25.1 in Bihar and Orissa, 35.9 and 27.1 in Bombay, 34.6 and 23.3 in Madras, 35.1 and 25.9 in the United Provinces, and 42.2 and 31.6 in the Punjab.

Rate of Survival.—Population is a function of two variables—birth-rate and death-rate. High birth-rate does not necessarily mean a high rate in the increase of population, since it may be offset by a high death-rate. The rate of increase depends upon the rate of survival, that is, the excess of births over deaths. The following Table comparing England and Wales with India over a quinquennium shows that in England and Wales birth-rate is lower than in India but due to a smaller death-rate, the survival rate is either larger than or equal to that of India where the effect of a larger birth-rate is neutralised by a heavy death-rate.

⁵¹ Compiled from the *Census Report of Bengal, 1931*, and *The Bengal Public Health Report, 1941*.

TABLE No. 72. Rate of Survival in England and Wales,
and in British India⁵²

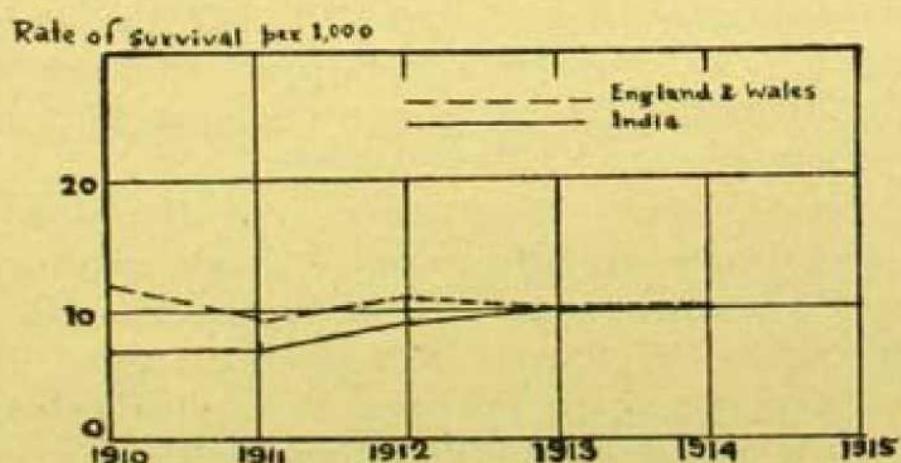
(Per 1,000 of total population)

Year	England and Wales			British (administered) India		
	Birth-rate	Death-rate	Survival rate	Birth-rate	Death-rate	Survival rate
1910	25	13	12	40	33	7
1911	24	14.5	9.5	39	32	7
1912	24	13	11	39	30	9
1913	24	14	10	39	29	10
1914	24	14	10	40	30	10

Graphically the rates of survival in the two countries stand thus:—

Diagram No. 10.

Rates of Survival (per 1,000 of total population)



Further comparative statements on the rate of survival will be found in the following table. It shows the number of survivors in every 100,000 born alive in different countries including India. Thus,

⁵² Cf. The Actuarial Report to the *Census Report of India*, 1931, Vol. I, Part I, p. 149.

TABLE No. 73. Number of Survivors out of 100,000 born alive in a few leading countries.⁵³

Age	United States (1901-10)		England (1901-10)		France (1898-1903)		Germany (1901-10)		Italy (1901-10)	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
5	82,195	84,668	79,398	82,178	77,692	80,496	74,211	77,334	72,816	73,935
10	80,605	83,143	78,083	80,756	75,944	73,616	72,827	75,845	71,325	72,136
20	77,957	80,581	76,113	78,756	72,948	75,246	70,647	73,564	68,579	68,891
30	73,222	76,009	72,741	75,779	67,653	70,068	67,992	69,848	64,108	64,103
40	66,996	70,383	67,668	71,308	61,641	64,583	62,598	65,283	59,669	59,215
50	58,963	63,539	59,903	64,742	53,818	58,385	55,340	59,812	53,799	54,097
60	47,701	53,104	47,564	54,157	43,199	49,441	43,807	50,780	44,902	48,638
70	31,050	36,512	29,898	37,646	27,465	34,053	27,136	34,780	29,835	31,742
80	12,295	15,831	10,608	15,545	8,774	12,789	8,987	12,348	10,079	10,667
	Switzerland (1901-10)		Holland (1901-10)		Norway (1901-10)		Denmark (1901-10)		India (1901-10)	
Age	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
5	82,469	85,054	80,243	82,690	88,366	89,922	85,229	87,558	55,308	56,608
10	81,201	83,760	78,850	81,314	86,769	88,308	84,240	86,566	50,212	51,450
20	78,797	80,778	76,612	78,937	82,817	84,459	82,205	84,180	43,833	44,828
30	74,506	76,025	72,907	75,501	75,866	79,064	78,862	80,598	35,831	36,745
40	69,100	70,706	69,090	71,109	70,408	73,449	74,773	76,341	27,136	28,139
50	60,692	64,362	63,265	65,733	64,356	67,660	68,284	70,990	18,658	19,714
60	47,298	53,897	53,551	57,299	55,862	60,032	57,639	62,598	11,229	12,165
70	28,306	34,922	36,866	41,243	41,911	47,135	40,684	47,405	5,134	5,637
80	8,928	11,903	14,681	17,659	21,083	25,413	17,333	22,300	1,032	1,159

⁵³ The table is compiled from the Actuarial Report of the Census Report of India, 1931, Vol. I, Part I.

So, out of ten countries, India has the worst record. The number of survivors is the least in each age group. The highest number of mortality occurs before the age of 5 is reached, and at 10 nearly half of those born alive are already wiped out. At 30, that is, at the age when man is just on the peak of his strength and vigour, only 35.83 per cent. are fortunate enough to survive. At 40, when he still retains his full working capacity, the number dwindles still further. But in England and Wales, according to the Census of 1921, more than half of the population was over 25 years of age and it was not until the age of 50 was reached that the percentage in higher age groups (19 per cent.) fell as low as in Bengal is reached before the age of 40.⁵⁴ So, an enormous wastage of human life is a most disturbing feature of our population problem.

(3) INFANT MORTALITY

The foregoing table throws light on another serious social malady that we have been suffering from. It is the very high rate of mortality during the first 5 years of birth. Child mortality in India is shockingly high. Thus, out of every 100,000 born alive, the average mortality during the first 5 years of birth of both males and females is as follows:—

TABLE No. 74. Mortality During the First 5 years of Birth Out of Every 100,000 Born Alive.

Country	No. of deaths during the first 5 years of birth	Country	No. of deaths during the first 5 years of birth
United States (1901-10)	16,568	Switzerland (1901-10) ...	16,238
England (1901-10) ...	19,211	Holland (1901-10) ...	18,533
France (1898-1903) ...	20,906	Norway (1901-10) ...	12,856
Germany (1901-10) ...	24,227	Denmark (1901-10) ...	13,606
Italy (1901-1910) ...	26,624	India (1901-10) ...	44,042

⁵⁴ *Census Report of Bengal, 1931*, p. 116.

An infant, however, is one that is not more than one year old.

Therefore, infant mortality, properly speaking, is mortality during the first year of birth. None the less, the rate of infant mortality in India is also very high. It is so high that the Census authorities for 1931 had to draw countries like Chile, Hungary and Straits Settlements out of their obscurity to compare India favourably. The infant mortality per 1,000 births in British administered India is, according to the Census of India, 1931, as follows:—

TABLE NO. 75. Infant Mortality in India

Year	Infant mortality per 1,000 born alive	Year	Infant mortality per 1,000 born alive
1911	... 204·98	1921	... 197·90
1912	... 207·65	1922	... 175·09
1913	... 194·61	1923	... 175·56
1914	... 211·83	1924	... 188·66
1915	... 201·90	1925	... 174·40
1916	... 202·34	1926	... 189·04
1917	... 205·18	1927	... 166·93
1918	... 266·96	1928	... 172·94
1919	... 224·40	1929	... 178·39
1920	... 194·93	1930	... 180·83

Infant mortality in India is compared to that of other countries in the table noted below:—

TABLE NO. 76. Infant Mortality in Different Countries⁵⁵

Country	Infant mortality per 1,000	Country	Infant mortality per 1,000
Chile	... 225	Yugoslavia (1937)	... 141
Egypt (1939)	... 198	Poland	... 140
Rumania	... 183	Mexico	... 136
British India	... 167	Hungary	... 134
Ceylon (1937)	... 158	Czechoslovakia (1937)	... 122
Portugal (1937)	... 151	Greece (1937)	... 122
Straits Settlements	... 151	Japan	... 114

⁵⁵ Nalanda Year Book, 1942, p. 43.

TABLE NO. 76.—*Contd.*

Country	Infant mortality per 1,000	Country	Infant mortality per 1,000
Italy (1937) ...	109	Germany ...	62
Argentine (1939) ...	92	England and Wales ...	52
Austria ...	80	South Africa (1939) ...	50
Belgium ...	75	New Zealand ...	50
Northern Ireland ...	75	United States (1939) ...	48
Scotland ...	70	Switzerland ...	43
Ireland ...	66	Sweden ...	41
France ...	66	Norway (1937) ...	41
Denmark (1937) ...	66	Australia ...	38
Canada (1939) ...	62		

Thus, out of 32 countries noted above, India occupies the fourth highest place as regards infant mortality, and excepting that of Rumania, the rate of that mortality is higher in India than that of any European country.

The figures for infant mortality in different provinces of India are as follows:—

TABLE NO. 77. Infant Mortality in the Provinces⁵⁶

Province	Infant mortality per 1,000 live birth	Province	Infant mortality per 1,000 live birth
United Provinces ...	261·2	Punjab ...	178·3
United Provinces ...	189·2	Bengal ...	174
Madras ...	186·6	Bombay ...	161·6

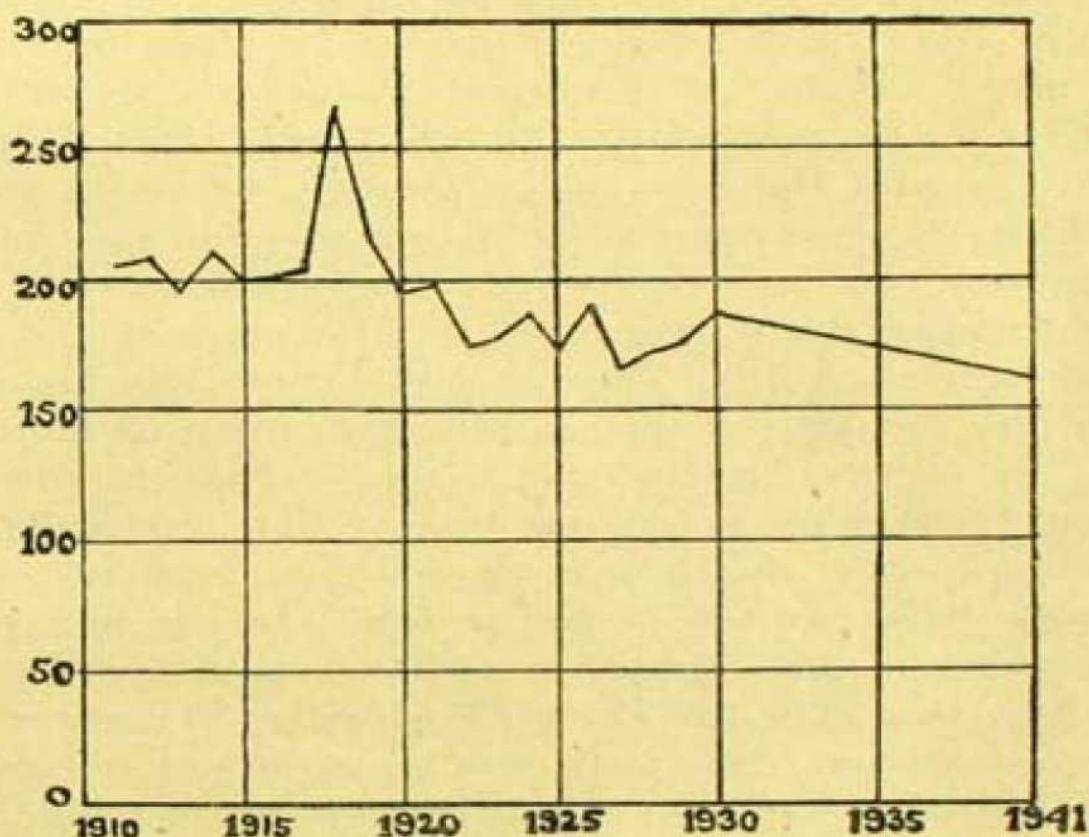
So, Bengal, as compared with other major provinces, had a little favourable position in regard to infant mortality. In 1940 and 1941 the mortality figures in Bengal further came down to 159·2 and 155·7 respectively per mille.⁵⁷ Nevertheless, it is still considerably high, and the highest rate of infant mortality is found in the towns.

⁵⁶ The figures are taken from the *Report of the Public Health Commissioner to the Government of India, 1931*, which are quoted by Sir Azizul Haque in *Man Behind the Plough*, p. 198.

⁵⁷ *Bengal Public Health Report, 1941.*

Now, the variation in the infant mortality rates in India since 1911 is graphically represented below:—

Diagram No. II. Variation in Infant Mortality Rates in India Since 1911



So what a tremendous wastage of human life in the first year of its existence is taking place every year in this unfortunate country. Millions are being brought to this world simply to take leave of it even before the dawn of sense. Such a high mortality rate cannot but have disastrous consequences upon the health and psychology of the people. Maternity is the worst affected. High infantile mortality is to some extent responsible for the high maternal mortality. But high birth-rate lies at the root of the two. Wattal and other writers on our population problem have shown that there is a close relation between high birth-rate and high



infant mortality. High infant mortality, as Wattal observes, is due to, first, the young age of the mother; secondly, large number of children born of a mother and the rapidity with which they are born; thirdly, insanitary conditions of child birth, and, fourthly, ignorance. Mr. Hutton, the Census Commissioner of India for the Census of 1931, from a comparative study of the infantile mortality in Calcutta, Bombay and Baroda State, has observed that "immature maternity, purdah and primitive obstetrics are probably still principally responsible for the high rate of infant mortality among Indian infants. To these, we think, should be added the low standard of living for the mass of the people resulting in very bad health of the parents and particularly of the mother, and in malnutrition and maltreatment of the child. Poor economic conditions are again responsible for many of the causes of high infantile mortality found by Messrs. Hutton and Wattal. Take the case of primitive obstetrics as an instance. There is hardly any one who can deny that it owes its continued existence to the economic backwardness of our people. In the first place, birth clinics in our country are still few and far between, and those that exist are chiefly localised in the cities, and these, too, are too costly to be serviceable to any one except the well-to-do. Secondly, due to the very limited scope of education found in the country, from which the masses of the people are excluded, they live in colossal ignorance and plod on wearily in the circumscribed path set forth by primitive customs and practices. Thus, the insanitary conditions of child birth, which are said to be another cause of infant mortality, are the direct consequences of ignorance and poverty. These two factors are, again, indirectly responsible for the frequency of motherhood at the early age. Moreover, to the extent premature child bearing and excessive child bearing at a relatively early age are responsible for high infantile mortality in India, the latter is dependent on the ignorance and poverty of the people. As a matter of fact, if we are to stop the devastating loss of

human life taking place in this country we must first of all have to fight relentlessly against poverty and ignorance. It must never be forgotten that "half the mortality recorded in India occurs in children under 10 years. Malnutrition is one of the chief causes of the rapid exit of young human beings from the world so soon after their arrival in it."⁵⁸

(4) MATERNAL MORTALITY

Another distressing feature of the population problem especially of Bengal is the high rate of maternal mortality. This can be seen from the table noted below:—

TABLE NO. 78. Comparative Death-Rates for
Males and Females, Bengal⁵⁹

Age	Death-rate per mille		Death-rate for female as a percentage of that for males
	Males	Females	
0—5	65·2	56·6	86·9
5—10	13·6	12·1	88·9
10—15	10·0	9·1	91·0
15—20	13·7	16·1	117·5
20—30	14·4	17·8	123·6
30—40	17·6	18·4	104·5
40—50	22·6	20·6	91·1
50—60	35·2	31·4	89·0
60 & over	74·8	67·5	90·2

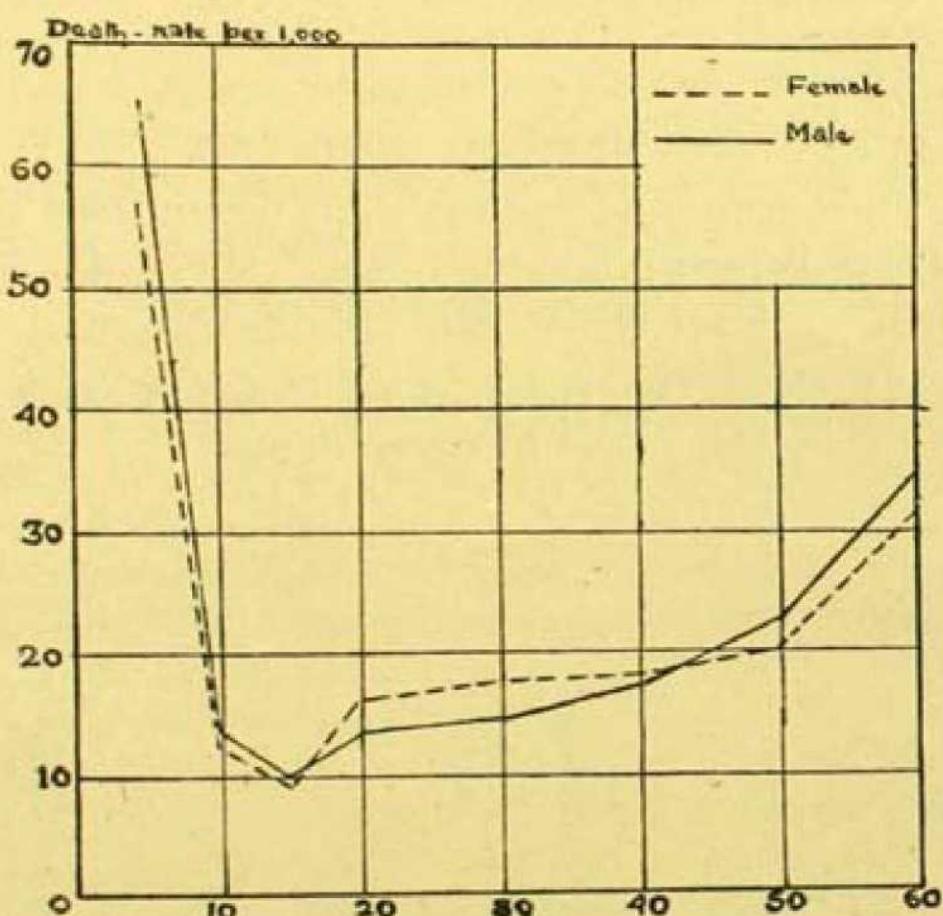
So it will be seen from the table that up to 15 years of age the rate of male mortality exceeds that of female mortality. But from 15 to 40 years the latter exceeds the former. The original position is, however, restored from 40 years and over. That is, the rate of female mortality surpasses that of the male mortality during the child-

⁵⁸ Quoted in *The Health of India* (Oxford Pamphlet), p. 8, from the observation by the Director of the Nutrition Research Laboratories, Coonoor.

⁵⁹ Compiled from the *Census Report of Bengal*, 1931, p. 137-8.

bearing age of the females. This can be shown graphically as below:—

Diagram No. 12. Comparative Death-Rates for Males and Females, Bengal



As for the reasons of the high rate of maternal mortality, almost all the factors that lie behind high infantile mortality are responsible for the high maternal mortality as well. These are: (1) the young age of the mother, (2) a large number of children born of a mother and the rapidity with which they are born, (3) insanitary conditions of child-birth, (4) ignorance and (5) poverty. Hutton has observed that "economic conditions have no bearing on maternal mortality". But we cannot agree to this view. As we have stated in the case of child mortality, poverty of the masses

lies at the root of most of the troubles. We maintain that once the poverty and ignorance of the people are removed, the premature child-bearing and excessive child-bearing at a relatively early age would no longer remain as things to worry about. Conditions of child-birth would also be radically changed. These can already be noticed among the wealthy and educated section of the people. So, what is primarily and essentially needed is the economic upliftment of the general masses as well as an improvement in the public health and sanitation. And these are today regarded as the most elementary duties of the State in every country.

One more serious matter of our population problem, which may be noted in this connection is the steady decline in the proportion of females to males in Bengal. The proportion of females per 1,000 males at each Census is shown below:—

TABLE No. 79. Proportion of Females per 1,000 Males in Bengal

Census Year	Females per 1,000 males	Total decrease during 69 years (1872-1941)	Average decrease during a decade	Decrease during 1931-41
1872	992	...	...	...
1881	994	...	...	...
1891	973	...	...	...
1901	960	...	...	...
1911	945	...	...	...
1921	932	...	...	...
1931	924	...	...	...
1941	899	...	...	...
		93	13·2	25

Thus, during the last decade, i.e., 1931-41, the decline in the proportion of females to males has not only continued, but the rate of decline has been nearly double the average rate. Pointing out this decrease, a recent authority on the Bengal Census has observed: "This decrease in the proportion of females, though partly due to immigration of



males from other provinces, and partly due to failure to enumerate females, especially Hindu females, is not a sign of good health of the community. Its causes must be found out and analysed. One cause seems to be the growing masculinity at birth but this only accounts for a small proportion of the total decrease. Is it a fact that we are neglecting our females more and more?"⁶⁰ This is a very pertinent question which Bengal will have to answer. We, in Bengal, have an excess of males over females at all ages. Not only this tends to give rise to many grave social evils including abduction and prostitution, but it is taken to be the sign of a decaying race. In England and Wales, inspite of an initial preponderance of males at birth, the higher incidence of male mortality reduces their number so far that there is an excess of females by the time the age-group 15—20 is reached by the population born in any given year, with the result that there is at all stages among the population of and over any given age a preponderance of women over men.⁶¹ Of the measures necessary to rectify the situation in Bengal may be suggested (1) complete removal of the traditional bias against female child, (2) remodelling of the social and economic systems so as to remove the causes leading to greater number of suicide cases amongst the females, (3) abolition of the purda system, (4) improvement in domestic sanitation, (5) compulsory elementary knowledge of health and hygiene for every boy and every girl, and (6) the abolition of poverty.

(5) & (6) ABSENCE OF BALANCE IN ECONOMIC LIFE AND APPALLING POVERTY

As for the fifth and sixth problems, viz., the absence of balance in our economic life resulting in intense pressure of population on land, and the appalling poverty and low

⁶⁰ From an article on "The Bengal Census of 1941" by J. M. Dutta, M.Sc., B.L., F.R.S. (London), published in the Puja Number of *The Hindusthan Standard*, October, 1942.

⁶¹ Cf. *Census Report of Bengal*, 1931, p. 116.



income *per capita*, both have already been discussed in the earlier part of this chapter. So, now we would take up the seventh problem, that is, the question of nourishment and medical treatment.

(7) PROBLEM OF NOURISHMENT AND PUBLIC HEALTH

Problem of Nourishment.—The problem of nourishment is intimately connected with the amount and nature of food-supply in the country relative to the amount and nature of the demand for food articles. It is, however, not our intention to deal here with the problems of demand and supply of food in the Province, as these form the subject-matter of another work by the writer. We would simply point out a few cardinal points in regard to the question of nourishment.

The problem of nourishment in this country is of two-fold character, viz., starvation and malnutrition, each of which is a very vital issue. Starvation means absence or insufficiency of diet in the required quantity. But malnutrition signifies the absence or insufficiency of essential nutritional requirements even though the diet is of the required weight and quantity. Indeed, as the Royal Commission on Agriculture have observed, a person suffering from malnutrition may be consuming more than his system can utilise, and more than he would normally consume if the diet were properly constituted. Hence, starvation and malnutrition are two quite distinct things.

Starvation means, taking all the food-articles together, the supply per head is less than the demand. When demand is greater than supply, either all people are partially starved or some people are wholly starved. Due to differences in the *per capita* income, however, the most unfortunate lot of living in starved or semi-starved conditions goes almost invariably with those of relatively lower income groups. This is what is actually the case in India. Indeed, Major General Sir John Megaw, the Director of the Indian



Medical Service, estimated in 1933 that only 39 per cent. of the Indian people were well-nourished; but 41 per cent. were poorly nourished and 20 per cent badly nourished. So more than three-fifths of the population of India were found insufficiently nourished and at least 80 million people were perpetually hungry. Professor Radha Kamal Mukerjee has estimated that India requires a food-supply of 321.5 billion calories, but her present food-supply can meet only 280.4 billion calories. India, thus, according to him, runs an annual deficit of food of 41.1 billion calories, which means that as many as 48 million people in the country must be going absolutely without food.⁶² Another authority has estimated that whereas the *per capita* annual food requirements amount to 1.27 million calories, the *per capita* food-supply in India stands at only 0.83 million calories a year, one-third less than what is necessary.⁶³ It may be pointed out, however, that there is as yet no unanimity as to the exact calorie requirements per head per day in India. The general estimate is that an average man at average work requires net calories of 2,124 to 2,735.⁶⁴ Making an allowance of 10 per cent. for loss during digestion and absorption, this means that the average man at average work should have an intake of food having a calorie value of about 3,000 and 2,400.⁶⁵ But such diet standards are considered to have been devised for the Western countries. For tropical regions like India the calorie requirement is taken to be much less. According to Dr. Aykroyd, Director of Food Research Laboratories at Coonoor, the minimum calorie requirements per head per day is 2,500. While another authority has expressed the opinion that judged by the low average body weight in India the total calorie requirements per head per day would

⁶² Mukerjee, *Food Planning for Four Hundred Millions*, p. 23-6.

⁶³ Cf. DeMellow, *Problems of Rural Reconstruction in India* (Oxford Univ. Press), p. 57.

⁶⁴ A calorie represents the amount of heat required to raise the temperature of 1 kilogram (2.2 lbs.) of water from 0°C to 1°C.

⁶⁵ Ray, *Cheap Balanced Diets* (Cal. Univ.), p. 42.

not be more than 1,800 at the rate of 15 calories per lb. of the body weight.⁶⁶ So far as the calorie requirement for the population of Bengal is concerned, we have estimated it elsewhere⁶⁷ to be about 51·2 billion calories, while the present food-supply in the Province can give roughly 42·7 billion calories. So, there is a deficit of 9·5 billion calories approximately.

Just as, however, there is no unanimity as regards the exact calorie requirements in India, so also the statistics regarding the supply of food-grains in India also lack precision. Sir John Russel, in his report on agricultural research in India, has arrived at the conclusion that the supply of all grains per head per day in the majority of the provinces is about 20 to 22 oz., which would give a calorie value of about 2,000 to 2,500 per head per day.⁶⁸ The figures for different provinces, according to Sir John Russel, stand thus:—

TABLE No. 80. Production of all Grains including Pulses and Oil-seeds per Head per Day in the Provinces

Province	Total grain production (Million tons)	Population (Millions)	Total grain production (oz.) per head per day
Assam	1·6	8·6	18
Bengal	9·3	48·9	19
Bihar & Orissa	9·0	36·7	24
Bombay	6·1	20·6	29
Central Provinces	4·8	15·5	30
Madras	10·4	46·7	22
Punjab	5·0	23·6	22
United Provinces	10·6	46·7	21

⁶⁶ Sir Alfred Chatterton at the East India Association, 'Asiatic Review', October, 1937, p. 731, quoted by Thomas and Sastry; *Indian Agricultural Statistics* (Univ. of Madras), p. 83-4.

⁶⁷ This forms the subject-matter of another work by the writer (in preparation).

⁶⁸ Report on the Work of the Imperial Council of Agricultural Research in Applying Science to Crop Production in India (1937), p. 17.

With regard to food-grains, therefore, considering India as a whole, there seems to be no serious shortage. Sir David Meek, in a paper read before the Royal Society of Arts in 1936, pointed out that, taking the period of 1909-10 to 1913-14 as the base, population increased by 0·60 per cent. per annum during 1901-31, while agricultural production increased by 0·65 per cent. per annum during the years 1909-34. Professor Radha Kamal Mukerjee also has estimated that, taking the figures for 1910-11 to 1914-15 as the base, while population increased by 17 per cent. during 1909-10 to 1914-15 and 1932-33, the production of food crops increased by 34 per cent. and total agricultural production by 27 per cent. It seems, therefore, that population has not so far moved ahead of production of food-grains.

When, however, other necessary articles of food, e.g., meat, fish, milk and milk products, vegetables, etc., are taken into consideration the deficiency becomes quite considerable. This will be noted from the following table:—

TABLE NO. 81. Total Annual Food Requirement and the Amounts Available in India⁶⁹

Food-stuffs	Ounces per day per adult (or consumption unit)			Total quantities in million tons		
	Required for a balanced diet	Available	Deficit (-)	Required	Available	Deficit (-)
Cereals ...	18	17·5	-0·5	54·0	52·5	- 1·5
Pulses ...	3	2·5	-0·5	9·0	7·5	- 1·5
Sugar ...	2	1·8	-0·2	6·0	5·3	- 0·7
Vegetables ...	6	3·0	-3·0	18·0	9·0	- 9·0
Fruits ...	2	2·0	Nil	6·0	6·0	Nil
Fats & Oils ...	1·5	0·6	-0·9	4·5	1·9	- 2·6
Whole milk ...	8 per capita	1·5	-7·5	32·0	6·3	-25·7
Butter milk ...	...	3·0	...	...	12·5	...
Meat, fish & eggs ...	2·3	0·5	-1·5 to -2·5	6·0 to 9·0	1·5	-4·5 to -7·5

⁶⁹ Memorandum on the Development of Agriculture and Animal Husbandry in India (Imperial Council of Agricultural Research), p. 17.

All the figures in the table are illustrative rather than absolute. The table shows in a general way the existing trend of consumption and how this needs modification. It may be noted that meat, fish, milk and milk products, and vegetables, etc., not only supply a considerable portion of the total calorie value required for a man, but their inclusion in the daily diet-schedule is indispensable as they supply some of the essential requirements of body-building, which are either absent or not present in sufficient quantities in the cereals and pulses. Particularly the absence of milk and milk products from the daily dietary of the vast majority of people is a serious matter for consideration. Meat, fish, vegetables and fruits need also to be consumed in much greater quantities than are done at present. Either total or partial absence of all these brings the question of malnutrition to the fore. Even where there is no starvation, there is malnutrition arising out of a lack of balanced dietary. Generally cereals and especially rice, wheat and in some cases millets are consumed in much larger quantities than what are necessary. Wheat is, of course, a better article of food than rice, as it contains, weight for weight, almost double the protein content of rice. Deficiency in protein is the general feature of Indian diet, and is the most distressing feature of the dietary of rice-eating peoples of Bengal, Orissa and Madras. Lack of protein in diet results in poor physique and low vigour, and makes the body an easy victim to diseases. So the question of health is intimately connected with the question of diet. Regarding the poor health of the peasants of Bengal it has been observed in an official report of the Director of Health that they are in large proportions taking a dietary on which even rats could not leave for more than a few weeks. This is indeed the darkest picture ever drawn of an entire people; but it is absolutely true. This will be observed from a brief survey of Bengal's food position given below.

The present output of principal food-stuffs in Bengal very roughly stands thus:—

TABLE No. 82. Present Output of Principal Food-stuffs in Bengal

Food-stuffs	Yield in thousand tons	Food-stuffs	Yield in thousand tons
Rice ...	8,200	Mustard Oil ...	150
Wheat flour ...	180	Raw Sugar or	630
Pulses including grams	800	Refined Sugar	210
Fish ...	180	Vegetables ...	1,640
Meat ...	270	Potato ...	270
Milk and milk products	1,250		

But the total requirement of food for 60 million people of this Province, keeping in view the optimum nutritional requirements and making an allowance of 35 per cent. of the net requirements on account of possible losses, seeds, provisions for emergencies and increase of population, would be as follows:—

TABLE No. 83. Estimated Food Requirements of Bengal

Food-stuffs	Required in thousand tons	Excess (+) or Deficit (-) in thousand tons
Unmilled or lightly milled rice ...	8,370	- 170
Whole wheat flour ...	4,940	- 4,760
Pulses ...	3,370	- 2,570
Sugar ...	1,650	- 1,440
Milk and milk products ...	8,370	- 7,120
Fish and meat ...	3,370	- 2,920
Non-leafy and green leafy vegetables	4,180	- 3,540
Edible Oils ...	1,650	- 1,110
Fruits ...	2,560	...
Eggs ...	82 or 164 millions	...

The table shows the great deficiency which the Province suffers from with regard to the supply of the essential food-stuffs. It is, true, however, that all the available food-stuffs in the Province have not yet been fully assessed. Especially, hardly any attempt has been made

to estimate the production of eggs and fruits. None the less, the figures can be taken as an index of the huge annual deficit in regard to the food-requirements of the Province. The Province can hope to be self-sufficient in rice provided it is taken along with other cereals. If, however, it is the only cereal taken in, it will also be insufficient to meet the requirements of Bengal. On the basis of cereal requirement of 18 oz. per head per day,⁷⁰ the net annual requirements of rice for the Province would be about 11 million tons. But her average annual production for 21 years ended 1942-43 has been 8·2 million tons, and the highest official record is 9·8 million tons for the year 1941-42.

Today the greatest need of the Province, as it is of the whole of India, is to devise a scheme of balanced diet so as to provide each man, woman and child with not merely their requisite energy value in calories but also the different necessary elements essential for the growth and maintenance of a healthy body. And the need of a healthy and strong physique is nowhere greater than in the case of the agriculturists, although its general need for the whole people of the Province is also very obvious. Indeed, as the Royal Commission on Agriculture have observed, the question of human and of animal nutrition is of fundamental importance to the whole problem of improved agriculture.⁷¹ But, if we want to solve the problem of human nutrition effectively, we must first devise a scheme of balanced diet and then launch a planned drive for food production to make that available to every man, woman and child.

Public Health.—The close relation between agriculture and public health and the reaction of the two upon each other 'to a remarkable degree' have been pointed out by the Royal Commission on Agriculture. Thus, "Economic wastage due to disease cannot be over exaggerated. Malaria slays its thousands and lowers the economic efficiency of

⁷⁰ 18 oz. of cereals per head per day is considered to be the maximum cereal requirement in an optimum diet.

⁷¹ *Report of the Royal Commission on Agriculture*, pp. 496-7.

hundreds of thousands; plague and cholera sweep the country from time to time; hookworm disease, Kala-azar and diseases arising from diet deficiency insidiously reduce the labour power of the cultivating classes."⁷² So, any enquiry into the general condition of agriculture and the position of the cultivator must take account of public health aspect of his life, along with the suitability of his diet and the sanitary conditions under which he lives, as also of his general rural environment. As the Agricultural Commission found and as they are doubtlessly today, these conditions in rural areas are very bad. Sanitation, in any accepted sense of the word, is practically non-existent. "Unprotected wells and tanks; unswept village streets; close pent windows excluding all ventilation: it is in such conditions that the average villager lives and yet succeeds in maintaining a remarkably high standard of personal cleanliness and tidiness." /

The unsatisfactory conditions of public health in the Province are reflected in the annual average of deaths and death-rates reported from various diseases. Thus,

TABLE No. 84. Annual Average of Deaths from Various Diseases in Bengal in the decade 1921-31

Cause of death	Annual average deaths (1921-31)			Percentage of deaths from all causes
	Male	Female	Total	
Fever	440,501	402,939	843,440	71.55
Cholera	37,027	33,605	70,632	5.99
Respiratory diseases	21,948	13,455	35,403	2.97
Dysentery and diarrhoea	14,847	13,030	27,877	2.36
Small-pox	9,724	8,931	18,655	1.58
Plague	27	9	36	0.30
Total	524,074	471,969	996,043	84.75

⁷² *Ibid.*, p. 482.

Thus, the greatest toll of life is taken by fever which accounts for more than 71 per cent. of the total deaths in the Province. Cholera comes next taking over 70,000 lives per year. Respiratory diseases cause annually more than 35,000 deaths, while dysentery and diarrhoea, and small-pox cause 27,877 and 18,655 deaths respectively. But even these figures of 'reported deaths' are much less than the actual number of deaths taking place annually, since a large number of deaths not unoften go unreported due, amongst other reasons, to the inadequacy of the reporting agencies, and to the unwillingness of the villagers to report each and every death. The Census authorities are not unaware of the inaccuracy of these returns. The *Census Report of Bengal, 1931*, states, "the conditions under which these returns are compiled through village chowkidars make it likely that in a very considerable number of cases inaccuracies or indefinite returns have crept in". So, the actual State of affairs happens to be much more serious than what is apparent from the figures given in the foregoing table.

Coming to more recent times, it is found that the mortality from different causes in 1940 and 1941 has been as follows:—

TABLE No. 85. Mortality in Bengal in 1940 and 1941¹²

Cause of death	Number of deaths		Death-rate per mille		Per cent. on total deaths	
	1940	1941	1940	1941	1940	1941
Fever	717,516	732,844	14·38	14·70	...	61·85
Respiratory diseases	85,203	84,647	1·71	1·70	...	7·14
Cholera	...	61,879	0·40	1·20	...	5·22
Dysentery and Diarrhoea	45,422	51,529	0·91	1·03	...	4·35
Small-pox	...	13,250	0·11	0·30	...	1·12
Leprosy	...	1,304	0·03	0·03	...	0·13
Total	...	945,785	...	18·96	...	79·81

¹² *Bengal Public Health Report for 1941* (1943).

As compared to annual average death-rates during the decade 1921-31, deaths from respiratory diseases, on the one hand, and from dysentery and diarrhoea, on the other, show considerable increase. Although fever records a lesser number of deaths, still it continues to take the heaviest toll. Of fever, again, malaria is responsible for more than half the deaths caused by all types of fever. This can be seen from the figures given below:—

TABLE No. 86. Annual Toll of Malaria in Bengal⁷⁴

Year	No. of deaths	Death-rate per mille	Per cent. of total fever mortality	Per cent. of total mortality
1940	369,448	7.40	51.49	...
1941	338,381	7.80	52.99	32.78

So, out of the total number of deaths of 23.7 per mille in Bengal in 1941, 7.80 or 32.78 per cent. were caused by malaria.

Difference between Urban and Rural Areas.—The differences in death-rates in urban and rural areas from different causes are noted in the following table:—

TABLE No. 87. Death-Rate per Mille in Rural and Urban Areas

Cause of death	Death-rate per mille			
	Rural area		Urban area	
	1940	1941	1940	1941
Cholera	0.40	1.20
Small-pox	0.06	0.10
Fever	15.20	15.50
Malaria	8.30
Kala-azar	0.32	0.33
Pneumonia	0.90
Pulmonary tuberculosis	...	0.17	1.29	1.26
				0.20

⁷⁴ Compiled from statistics given in *Bengal Public Health Report for 1941*.

Thus, small-pox, respiratory diseases and leprosy take a heavier toll in urban than in rural areas. Fever, including malaria and kala-azar, is responsible for far greater number of deaths in the countryside than in the towns. Cholera does not seem to make much difference in the two areas. Malaria remains the main problem in rural areas.

Inadequate Health Service.—The most regrettable fact to be noted in this connection is that the vast majority of deaths occur from preventable diseases. As early as 1924 the All-India Conference of Medical Research workers estimated that the average number of deaths resulting every year in India from preventable diseases was about 5 to 6 millions, that the average number of days lost to labour by each person from preventable disease was not less than 15 to 21 days each year and that the percentage loss of efficiency from preventable malnutrition and disease was not less than 20 per cent. Even these estimates were under-statements rather than exaggerations. But allowing the greatest possible margin of error, "it is absolutely certain that the wastage of life and efficiency which results from preventable disease costs India several hundreds of crores of rupees each year. Added to this is the great suffering which affects many millions of people every year."⁷⁵

Such huge wastage of human energy and wealth could, of course, be avoided, if the questions of health and sanitation were seriously attended to. 'Public Health' has long been a concern of the Provincial Government. But due partly to lack of funds and partly to the apathy of the authorities concerned, very little has so far been done to effect an improvement in the general health condition. The total expenditure on Public Health by the Central and the Provincial Governments in 1940 amounted to only Rs. 6,32 laks. Bengal, according to the Indian Statutory Commission, spends annually barely 0.285 rupees per head on public health measures. There is also a considerable

⁷⁵ A. C. Report, pp. 481-2.

dearth of Public Health personnel. In 1941, in the whole of Bengal the Public Health Service was constituted of the following personnel only:—

TABLE No. 88. Public Health Service in Bengal, 1941

		Urban area	Rural area
Medical Graduates with P.H. qualifications			
—working whole time	...	30	28
—working part time	...	1	...
Medical Graduates without P.H. qualifications			
—working whole time	...	2	2
—working part time	...	2	15
Medical Licentiates with P.H. qualifications			
—working whole time	...	1	11
—working part time	...	1	...
Medical Licentiates without P.H. qualifications			
—working whole time	...	10	141
—working part time	...	6	...
Epidemic Staff	...	45	297
Sanitary and Health Inspectors	...	110	593
Vaccinators : Males	...	153	2,349
Females	...	26	57
Vaccination Inspectors	...	...	11
School Medical Officers	...	5	2
Other Health Staff	...	103	508
Total	...	495	4,014

So, for a population of 60·3 millions there were, all told, only 4,509 persons serving in the Health Service. That is, one person was required to serve as many as 13,373 men, which was an impossible task. Thus, not only the personnel of the public health service is insufficient, but the funds spent by various agencies, including the Provincial Governments, Municipalities, District and Union Boards, are still mere drops in the ocean of our needs. Besides, the work so far done by these agencies for the improvement of public health and sanitation, whether as curative or preventive measures, is quite far from meeting the actual needs.

The remedy lies in an all-round drive against hunger, disease, poverty and ignorance. What has hitherto been done is mainly so many patch-works on the surface. A thorough overhaul of the entire economic fabric is a vital necessity. The problem of health, although it is in itself a gigantic task to solve, cannot be separated from the question of dietary. A proper and well-balanced diet can, again, be brought to the reach of every member of the community only after a systematic drive for food-production has been carried out. This, however, requires a well-conceived and well-laid planning of production of at least the essential food articles. But the planning of food-production presupposes certain conditions which can be achieved only by changing the very basis of agriculture existing hitherto.

(8) ILLITERACY

Another important problem of population in this country is the very high percentage of illiteracy. According to the Census of 1941, there are 47,322,700 literate persons in the whole of India out of a total population of 388,800,000, which brings the proportion of literate persons throughout India to 12·1 per cent. This, however, amounts to a 70 per cent. increase over 1931 figures. The increases for the provinces and the States during the decade have been 80 and 70 per cents. respectively. The total literate persons in the whole of India in 1921 numbered 22,623,651 which brought the percentage proportion of literate over total population to 7·1. The number increased in 1931 by 5,515,205, that is, by 24·5 per cent., thereby raising the proportion of literate persons in the whole of India to 10·9 per cent.

Number of Literate Persons in the Provinces.—The number of literate persons and the percentage of literate

over total population in different provinces and States, as recorded by the Census of 1941, is as follows:—

TABLE NO. 89. No. and Per Cent. of Literate Person in different Provinces and States (1941)

Province and State	Literate persons	Per cent. of literate over total population	Percentage increase since 1931
Bengal	9,832,077	16	...
Bombay	4,067,800	19.5	100
Madras	6,420,900	13.0	...
United Provinces	4,653,300	8.4	...
Punjab	...	12.8	140
Bihar (including Chota Nagpur)	3,339,700	9.2	...
Central Provinces and Berar	1,909,700	11.3	...
Assam	1,174,300	11.5	...
North-West Frontier	233,900	7.6	...
Sind	473,800	10.4	...
Orissa	948,200	10.8	...
Bengal States	127,500	5.9	...
Travancore State	2,894,400	45.0	...
Mysore	896,400	12.2	...
Hyderabad	1,111,200	6.8	...
Baroda	656,800	22.9	...
Cochin	504,100	35.4	...

So, as regards the total number of literate persons, Bengal comes first, but in percentage of literate over total population she occupies the fifth place among the States and the provinces, and the second among the provinces only.

It may be observed that literacy, for the purposes of Census, is defined "as the ability to write a letter and to read the answer to it". It does not include those who can read, but cannot write, of whom there is a considerable number. It excludes also those who are under the age of 5.⁷⁶

Literacy in Bengal.—The total number of literate persons in Bengal, according to the Census of 1931, was as follows:—

⁷⁶ *Census Report of India, 1931, Vol. I, Part I, p. 324.*

TABLE NO. 90. Total Literate Persons in Bengal (1931)⁷⁷

Sex	Total population	Literate	Literate in English	Per cent. of literate over total population
Male ...	26,557,860	4,101,963	968,505	15.5
Female ...	24,259,478	678,484	99,935	2.8
Both sexes ...	51,087,338	4,777,447	1,068,440	9.4

According to the Census of 1941, however, the total number of literate persons in Bengal is 9,832,077, of which 7,718,477 are males and 2,113,600 females. The percentage of literate on total population is about 16 and represents 25 for males and 7 for females. Of the five administrative divisions of Bengal, the largest number of literates is found in the Presidency Division, it being 2,674,256. Next in order comes Dacca Division with 2,300,480; Burdwan Division with 1,977,407; Chittagong Division with 1,485,351 and Rajshahi Division with 1,394,583.

Progress of Literacy.—The progress of literacy in Bengal since 1881 is noted in the following table:—

TABLE NO. 91. Progress of Literacy in Bengal since 1881⁷⁸

Sex	Number of literate per mille of 5 and over					
	1931	1921	1911	1901	1891	1881
Male ...	180	181	161	147	156	137
Female ...	32	21	13	9	7	4
Both sexes ...	110	104	...	...	...	...

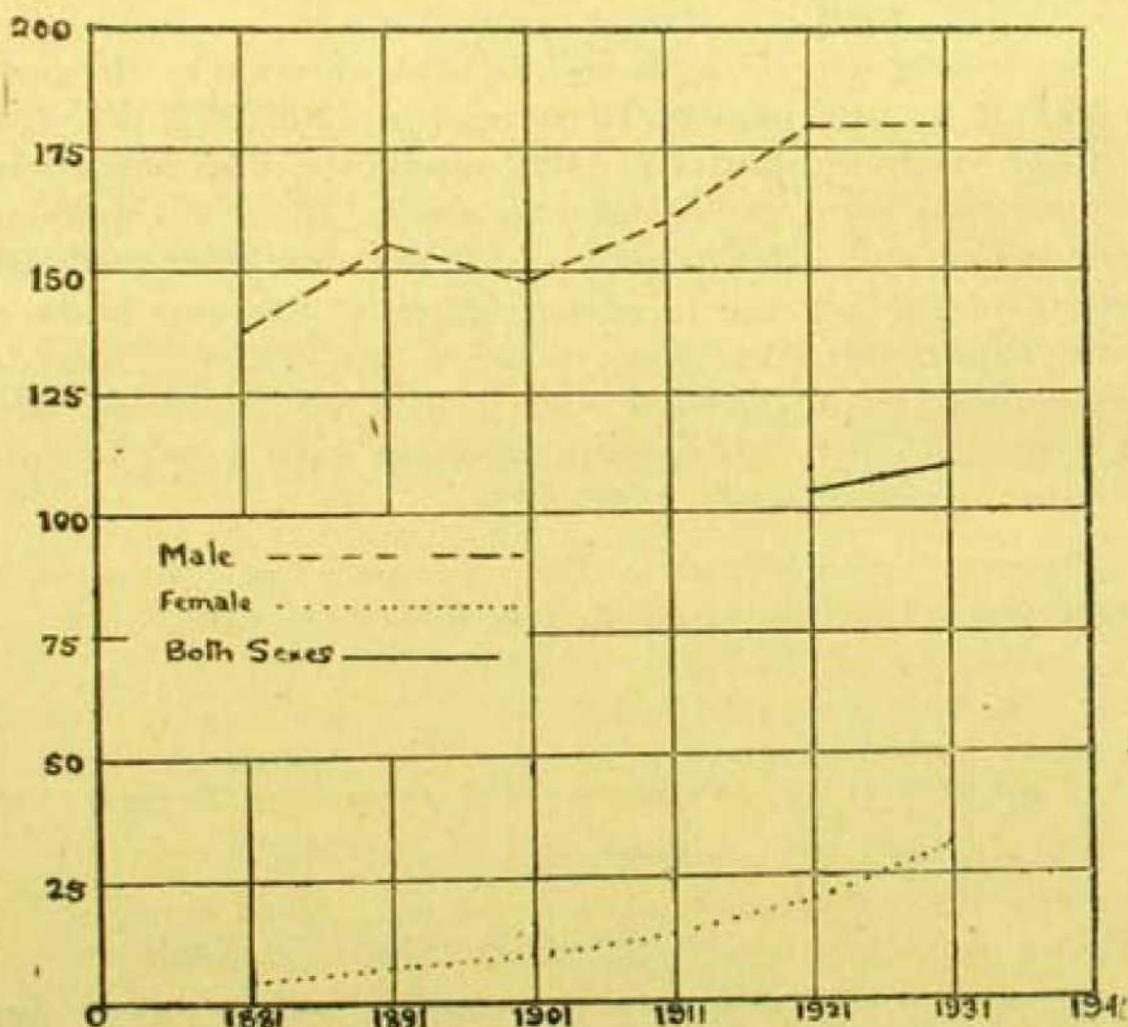
⁷⁷ Compiled from the *Census Report of Bengal, 1931*, Subsidiary Table VII.

⁷⁸ *Ibid.*, Subsidiary Table VI.

The progress of literacy in Bengal and India since 1881 is graphically represented below:—

Diagram No. 13. Growth of Literacy per 1,000 of Total Population

So, not only the percentages of literate persons in both Bengal and India are very small, but the progress of literacy also has been extremely tardy.



The progress of literacy in the different administrative divisions of Bengal has been different. In the Burdwan Division the number of literate per mille increased from 197 in 1881 to 252 in 1931 for males and from 3 in 1881 to 36 in 1931 for females. In the Presidency Division, the

increase for males was from 156 to 205 and that for females from 8 to 51 per mille during the same period. While in the Rajshahi, Dacca and Chittagong Divisions the increases for males were from 88 to 125, 108 to 162, and 159 to 183 and those for females from 3 to 16, 3 to 36, and 5 to 23 respectively.

Literacy in Other Countries.—As compared with the literacy figures for Bengal and India, those for the leading countries of the world are:—

TABLE NO. 92. Percentage of Literacy in different Countries. (For population aged 10 years and over)

Country	Literacy per cent.	Country	Literacy per cent.
Bengal (1941) ...	... 16·0*	U.S.A. (1930) ...	... 95·7
India (1941) ...	... 12·1*	Japan (1930) ...	... 96·0
India (1931) ...	... 10·9*	Australia ...	... 98·3
U.S.S.R. (1930) ...	... 90·0	Germany ...	... 99·7
Great Britain (1931) ...	... 92·5	Spain (1935) ...	... 68·9
France (1931) ...	... 94·5	Turkey (1934) ...	... 44·9
Canada (1930) ...	... 94·9	Italy (1935) ...	... 81·0

* For population aged 5 years and over.

Thus, in the progressive countries like the U.S.S.R., Great Britain, France, Canada, the United States, Japan, Germany and Australia the literacy figures range between 90 to almost 100 per cents.

Number of Educational Institutions and Scholars.—The variation in the number of Institutions and Scholars in Bengal since 1901 is shown in the following table:—

TABLE NO. 93. Variation in the Number of Educational Institutions and Scholars in Bengal since 1901

	1938	1931	1921	1911	1901
No. of Institutions ...	62,527	67,639	53,962	41,448	37,733
No. of Scholars ...	3,401,110	2,712,553	1,946,252	1,561,932	1,133,896

The different institutions and the number of scholars distributed therein in 1931 were as follows:—

TABLE NO. 94. Number of Institutions and Scholars in 1931⁷⁹

Class of Institutions	No. of Institutions	No. of Scholars
I. Public Institutions	66,006	2,650,457
1. University and Collegiate Education : ...	67	25,157
(i) Universities	2	1,835
(ii) Arts Colleges—		
(a) For boys	44	17,847
(b) For girls	4	342
(iii) Law Colleges	3	2,555
(iv) Medical Colleges	3	1,302
(v) Engineering Colleges	1	298
(vi) Training Colleges	5	184
(vii) Commercial Colleges	4	653
(viii) Veterinary Colleges	1	141
2. School Education—General : ...	62,774	2,497,358
(i) High English Schools—		
(a) For boys	1,075	257,312
(b) For girls	59	14,815
(ii) Middle English Schools—		
(a) For boys	1,815	160,496
(b) For girls	52	6,658
(iii) Middle Vernacular Schools—		
(b) For girls	54	3,810
(a) For boys	12	1,270
(iv) Primary Schools—		
(a) For boys	42,716	1,636,469
(b) For girls	16,991	616,528
3. School Education—Special : ...	3,165	127,942
(i) Training School—		
(a) Masters	92	2,572
(b) Mistresses	10	240
(ii) Medical Schools	9	2,244
(iii) Engineering or Survey Schools	2	548
(iv) Technical and Industrial Schools ...	142	5,711
(v) Commercial Schools	728	1,301
(vi) Madrasahs	2,743	69,824
(vii) Miscellaneous Schools	2,139	45,502
II. Private and Unrecognised Institutions ...	1,633	62,096
(a) For boys	1,278	51,426
(b) For girls	355	10,670

The numbers of educational institutions and scholars however, were in 1938, 62,527 and 3,401,110 respectively.

⁷⁹ *Census Report of Bengal, 1931*, Subsidiary Table VIII.



Taking the population of Bengal in 1938-39 as 58 millions—after adding to the Census figures for 1931 an annual increase at the rate of one million for 8 years—there was, in 1938, one scholar in every 17 persons.

IV. LOW EXPECTATION OF LIFE

Now, the various factors discussed in the preceding Section give rise to a quick succession of generations of weaklings with a considerably low average of life's span. Born of weak, under-nourished and undeveloped parents, a vast majority of the children inherit all the parental weaknesses and grow normally in an atmosphere largely hostile to the development of a sound physique and mind. The babies in India as a rule start with a great handicap as compared with those of other countries. Weight at birth is taken to be an indication of the general health of the infants, and the average weight here in India is about 1 lb. less than that in England. Starting with this initial handicap and passing through a hostile or unhealthy and disagreeable environment it is no wonder that almost half of those born alive find themselves in graves before the age of 10 is reached. Those who are fortunate enough to pass this hurdle have other obstacles to negotiate and in the course of negotiating one after another hurdle the number decreases on and on. By the time the age of 40 is reached, more than four-fifths are already out of this world's drama never to stage back again. But 40 is the age which is considered as the zenith of human life in strength and vigour in the progressive countries, and more than 60 per cent. of those born alive survive in those countries at this age.

So we come to another important feature of our population problem, *viz.*, an unusually low expectation of life. The average expectation of life in India is far less than those found in most European and Asiatic countries. The expectation of life in years at birth in the important countries of Asia and Europe is noted below:—

TABLE No. 95. Expectation of Life in different Countries^{**}

Country	Expectation of life in years at birth	
	Males	Females
United States (1901-10)	49.32	52.54
England (1901-10)	48.53	58.53
France (1898-1903)	45.74	49.13
Germany (1901-10)	44.82	48.33
Italy (1901-10)	44.24	44.83
Denmark (1906-10)	54.90	57.90
Holland (1900-09)	51.00	53.40
Japan (1898-1903)	43.97	48.50
India (1901-10)	22.59	23.31

Thus, the average expectation of life at birth is the lowest in India. What is, however, far more serious is that the low expectation has obstinately persisted throughout the last 50 years. The all-India average from 1881 has been as follows:—

TABLE No. 96. Variation in Expectation of Life in India since 1881

Year	Expectation of life in years	
	Males	Females
1881	23.67	25.58
1891	24.59	25.54
1901	23.63	23.96
1911	22.59	23.31
1931	26.96	26.56

During half a century India has, thus, added only 3.29 and 0.95 years to her average life of males and females respectively. But within a much shorter period, that is, within 20 years, from 1901 to 1921, England added to her average life of males and females as many as 11.55 and 11.88 years respectively. The average expectations of life for

** Taken from the Actuarial Report to the *Census Report of India*, 1931, Vol. I, Part I.

different age groups in India and England may be compared below:—

TABLE No. 97. Average Expectations of Life for different Age Groups in India and England⁸¹

Age	All-India						England					
	Males			Females			Males			Females		
	1901	1911	1931	1901	1911	1931	1901	1911	1921	1901	1911	1921
0	23.63	22.59	26.91	23.96	23.31	26.56	44.07	46.04	55.62	47.70	50.02	59.58
10	34.73	33.36	36.38	33.86	33.74	33.61	49.65	52.35	44.64	51.98	55.02	57.53
20	28.59	27.46	29.57	28.64	27.96	27.08	41.04	43.67	45.78	43.45	46.36	48.73
30	22.90	22.45	23.60	23.82	22.99	22.30	33.06	35.29	37.40	35.43	37.84	40.26
40	17.91	18.01	18.60	19.12	18.49	18.23	25.65	27.27	29.19	27.81	29.65	31.86
50	13.59	13.97	14.31	14.50	14.28	14.65	18.89	18.85	21.36	20.63	21.87	23.60
60	9.53	10.00	10.25	10.02	10.11	10.81	12.09	13.83	14.36	14.08	14.81	16.22
70	5.80	6.19	6.35	5.98	6.22	6.74	8.02	8.25	8.75	8.74	9.13	9.95
80	3.07	3.06	3.13	3.12	3.06	3.25	4.40	4.64	4.93	4.84	5.10	5.56
90	1.23	1.15	1.12	1.64	1.10	1.18	2.32	2.37	2.82	2.68	2.55	3.13

The average expectation of life in India may further be compared with expectations in a few other progressive countries of the world. Thus,

TABLE No. 98. Average Expectations of Life in some Leading Countries⁸²

Age	United States (1901-10)		Australia (1901-10)		Germany (1901-10)		France (1898-03)		Japan (1898-03)		India (1901-10)	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
0	49.32	52.54	55.20	58.84	44.82	48.33	45.74	49.13	43.97	44.85	22.59	23.31
10	50.86	52.89	53.53	56.39	51.16	53.35	49.75	52.03	48.23	48.34	33.36	33.74
20	42.39	44.39	44.74	47.52	42.56	44.84	41.53	44.02	40.35	41.06	27.46	27.96
30	34.80	36.75	36.52	39.33	34.55	36.94	34.35	36.93	33.44	34.84	22.44	22.99
40	27.55	29.28	28.56	31.47	26.64	29.16	27.15	29.60	26.03	29.19	18.02	18.49
50	20.59	21.86	21.16	23.69	19.43	21.35	20.26	22.14	18.97	21.11	13.97	14.28
60	14.17	15.09	14.35	16.20	13.14	14.17	13.81	15.08	12.76	14.32	10.00	10.11
70	8.96	9.52	8.67	9.96	7.99	8.45	8.42	9.21	7.89	8.77	6.17	6.22
80	5.07	5.43	4.96	5.73	4.38	4.65	4.87	5.38	4.44	4.85	3.04	3.06
90	2.90	3.05	2.64	2.99	2.35	2.59	3.29	3.84	2.22	2.36	1.23	1.10
100	1.66	1.90	1.18	1.24	1.50	1.87	1.93	2.59	0.50	0.82	...	...

⁸¹ Ibid.

⁸² Census Report of India, 1931, Vol. I, Part I, pp. 171-2.

As a matter of fact, the average expectation of life in India is lower than that in each of the following countries, *viz.*, U.S.A., Canada, South Africa, Japan, Germany, Australia, Belgium, France, Ireland, Italy, Holland, United Kingdom, Northern Ireland, Sweden, Czechoslovakia, Russia, Austria, New Zealand and even Egypt.

As among the provinces of India, all are more or less equally placed although Bengal and the United Provinces come last. The average expectation for the provinces, as recorded in the Census of 1931, is noted in the table below:—

TABLE NO. 99. Average Expectation of Life in the Provinces of India (1931)

Age	Bengal		Bihar & Orissa		Bombay		Madras		United Provinces		Punjab	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
0	24.91	24.80	28.88	26.90	27.84	26.37	28.71	30.04	24.56	25.09	28.05	26.57
10	33.68	31.31	37.59	33.78	36.72	34.41	37.61	36.17	35.45	33.97	38.07	34.80
20	27.08	25.27	29.97	27.07	29.61	28.48	30.60	29.05	29.06	27.75	31.22	28.88
30	21.39	20.98	23.55	22.54	23.70	23.66	24.36	23.83	23.11	23.24	25.45	24.44
40	17.11	17.61	17.93	18.11	18.43	19.15	19.17	19.22	17.96	19.32	20.13	20.49
50	13.62	14.51	13.36	13.72	13.73	14.79	14.79	14.99	13.61	15.37	15.09	16.14
60	10.16	10.95	9.39	9.75	9.55	10.48	10.56	10.81	9.64	11.00	10.22	11.48
70	6.38	6.85	5.96	6.21	5.89	6.46	6.45	6.69	5.98	6.50	5.98	7.03
80	2.92	3.22	3.08	3.40	2.95	3.17	3.13	3.29	2.98	3.10	2.91	3.43
90	1.00	1.10	1.20	1.53	1.00	1.11	1.13	1.34	0.71	1.41	1.19	1.31

Consequences of the Low Expectation of Life.—A low expectation of life is fraught with grave consequences. It is likely to have serious repercussions on society—both moral and material.

Moral Consequences.—The moral effects of low expectation of life will generally be as follows. Firstly, it tends to engender a feeling of apathy towards this world. The quick succession of deaths always remind people of the grim but inevitable end that awaits every one of them in not too distant a future. This causes a disinterestedness in everything worldly and fosters a greater regard for the after-



life. People are bent upon accepting their life in this world as a mere sojourn, a stop-gap, for reaching the supposed real stage of human existence, that is, for living the life hereafter. The transitoriness of life in this world robs it of the incentive to make this world the fitting abode of man, and people are always eager to make an exit out of this mortal world in order to escape from the sorrows of short-lived pleasures and to test the imagined eternal bliss of the next world. Thus, the general tendency happens to be that people become mentally weak and sentimental, and they lack the strength and grit necessary to face the difficulties of the world. Too much dependence upon fate is seen. People blame their fate and make it responsible for all their sufferings. Hence follows the second result. That is, the low expectation of life makes men unfit to live in this world. Those who do not love this world cannot try hard to make it worth living. They cannot die, if need arises, to make this world beautiful. They are, thus, wanting in the vigour and energy required for effecting the material progress of the world. As such, they are cornered even in the territory of their own by the people of a race of superior energy and virility, to whom this world is a place worthy to live in and worthy to die for. The people of this latter race are found to cross the oceans, scale the mountains, and explore the unknown recesses of the land, sea and the air, all with a view to enriching and ennobling life on the surface of this earth.

The truth of what we have said above has nowhere a greater demonstration than in India. It is in India that the expectation of life is the lowest. It is in India that we find the greatest apathy for this mundane world and also the greatest regard for the life hereafter and at the same time maximum reliance upon fate. It is in India, again, that we find ourselves dominated by a people of another race. The more we think of the world to come hereafter and the less we think of the hitherworld, the more and more we become unfit to live in this world. If we want to live as men and



not as so many slaves, if India is to get her due share in the comity of nations, if she is to be restored to the full majesty of her rich and hoary traditions, we must remove this life-killing apathy in us towards this world and to all its affairs. We must bring home to every one of our countrymen the fact that this world is a worthy place to live in. Here life can be made full, free and beautiful. The glories of human life are as good as those of the supposed life hereafter. Every man has the potential power hidden within himself to attain those glories. In short, faith in man and in the world is to be revived. The essential preliminary to the revival of that faith is, however, to lengthen the average expectation of life. The life of a man must be long enough to leave a sufficient margin, after the preparatory stage is finished, to enable him to enjoy the fruits of his long preparation and to apply all his potentialities in furtherance of the interest of the society as well as of himself.

Material Consequences.—As for the material effects of low expectation of life, the most serious loss that the society bears is the huge wastage of human energy and power. A man with an expectation of life of 55·62 years can obviously do in his life-time more than 5 times as much work as is done by a man having an expectation for only 26·91 years. This is deducted as follows. A common period of, say, 20 years is excluded from the life period of both of them as necessary for general and technical preparation. Even assuming that the two men are placed in exactly similar positions, that is, as regards preparation, equipment and efficiency, the first will therefore be contributing his share to the society for a period of about $35\frac{1}{2}$ years, while the latter will do it only for about 7 years. Thus, even apart from the differences in efficiency and capacity of work arising out of the differences in expectations of life, the man having a higher expectation will do in course of his life a much greater volume of work than what a man with lower expectation will do. This is a wastage that a community cannot afford to bear for long and must be stopped at all costs.

The material wastage can also be viewed from another aspect. An Englishman whose average expectation of life is 55.62 years, will perform in one generation as much work as will take 5 generations for an Indian with an expectation of 26.91 years to do. Even on the basis of the daily output of work in India of 0.47 horse-power *per capita*, an Englishman will be able to do in $35\frac{1}{2}$ years of his working life 6,090.02 horse-powers of work, while an Indian, in his short working life of about 7 years, will add work of only 1,200.85 horse-power, that is, barely one-fifth of the work added by an Englishman. Consider then what tremendous differences in efficiency of work and in its total quantum follow correspondingly from a difference in the expectation of life, even assuming that there are no difference of any other kind. In the following table will be found the results of our calculation as to how many generations in India will be required to perform the work equivalent to that done by a single generation in various important countries, assuming all these generations to be placed under similar circumstances in every respect save and except the expectation of life. The figures stated against each country represent the number of Indian generations that will do work equivalent to that done by one generation in that country. Thus,

TABLE NO. 100. Comparative Efficiency of Work in different Countries

Country	No. of Indian generations required to do the work equivalent to that done by a single generation of the country in question		
United States (1901-10)	4	
England (1921)	5	
France (1898-1903)	3.6	
Germany (1901-10)	3.2	
Italy (1901-10)	3.1	
Denmark (1906-10)	5	
Holland (1900-09)	4.4	
Japan (1898-1903)	3.4	

Again, the output of work for each generation in the different countries, on the basis of the Indian average output *per capita* in horse-power, is as follows:—

TABLE No. 101. Work (in horse-power) done in the Working Life^{**} of a Generation of Males

(On the basis of daily *per capita* output in India)

Country	Output of work (h.p.) <i>per capita</i>	Country	Output of work (h.p.) <i>per capita</i>
United States (1901-10)	5,029.84	Denmark (1906-10)	... 5,987.09
England (1921)	... 6,090.02	Holland (1900-09)	... 5,318.05
France (1898-1903)	... 4,414.69	Japan (1898-1903)	... 4,112.05
Germany (1901-10)	... 4,257.87	India (1931)	... 1,200.85
Italy (1901-10)	... 4,158.37		

Thus, an Indian (male) with his lowest average expectation of life contributes throughout his life much less working capacity to the society than what a member of his sex does in other parts of the world. This difference, it should be remembered, arises only out of differences in expectations of life. If, along with the latter, the differences in general and technical efficiency are counted, the results would lead to far greater variations in the respective contributions. The daily output of *per capita* work in horse-powers in different countries, taking all the factors into account, are noted below:—

TABLE No. 102. Daily Output of Work *per capita*^{**}

Country	<i>Per capita</i> daily work in horse-power	Country	<i>Per capita</i> daily work in horse-power
United States	... 13.38	France	... 4.35
Canada	... 13.03	Japan	... 1.75
Great Britain	... 6.65	India	... 0.47
Germany	... 6.04		

One of the principal reasons why India has the lowest *per capita* output of work is that she still makes the greatest use of human labour, as opposed to mechanical labour, in

^{**} Working life is arrived at by deducting the basic age of preparation of 20 years from the total expectation of life.

^{**} Taken from Visvesvaraya, *op. cit.*, p. 129.

comparison with other countries. However, even leaving out these differences arising out of differences in technical efficiency, the variations in the output of work per head in each of the above countries as compared with that in India resulting simply from differences in the expectations of life are quite considerable. So, it can be understood that the low expectation of life in India causes loss of work to the extent of hundreds and thousands of horse-power for each single person.

Apart from, however, this enormous loss of physical energy, the economic losses involved are not inconsiderable. If the expenses required to equip a man in the preparatory period of his life is assumed to be the same for each country, then in the country where 5 generations are required to produce the work equivalent to that done by a single generation in another country, the former has to incur 5 times the equipment expenses of the latter in order to give rise to the same quantum of work in horse-power. This necessarily involves a great wastage of national wealth which a country can afford to bear only at the cost of its material prosperity.

So we see that the low expectation of life alone is responsible for the loss of a vast amount of human and material wealth. Even assuming that an Indian is given the same set of circumstances in which an average Englishman or a German normally finds himself, the single cause of low expectation will result in wide variations in the contributions of the former as compared to those of the latter. If we are to ensure the creation of a healthy society we have got to stop the loss following from a low expectation of life. A gain in the expectation of life can be secured to a considerable extent by improvements in social and health conditions. It is true, as some would like to argue, that heredity may go against prolonging the expectation of life, but it cannot altogether brush aside the influence of environments. The idea that heredity alone is responsible for higher expectation of life and, as such, things in this

regard cannot be improved upon in India, must be thoroughly dispelled. As a matter of fact, we must not forget that "from the point of view of longevity, environmental influences are still more powerful than heredity, important as that may be."⁵⁵ So, no efforts would be too great to prolong our present average expectation of life.

V. PROBLEM OF OVER-POPULATION

The problem of population in Bengal, as it is in the rest of India, is the large increase from decade to decade in the total number relative to the increase in or the availability of the food-articles, which brings, as its inevitable consequence, untold sufferings to a vast majority of the people. It should, however, be noted that mere number, however big it happens to be, does not mean that a country is over-populated. Neither, on the contrary, the fact that a country is progressively having an increase of population shows that it is not suffering from a scarcity of food supply. Countries like Great Britain and the U.S.A., for example, where the percentage increases of population have been much greater than in India, cannot be said to suffer the least from over-population. In England and Wales, as we have seen earlier in this Chapter, there had been a total increase of population of 53·8 per cent. during the 50 years ended 1931, yet it has not been heard that scarcity of food has been the direct cause of any death there.⁵⁶ But India, where population has had an average increase of less than one per cent. per annum, has been notwithstanding all the professions to the contrary, found to be alarmingly deficient in her total food-supply, and what is true of India generally is also true of the province of Bengal. Deaths following directly from the scarcity of food has long been a chronic to this country. In point of

⁵⁵ Wattal, *op. cit.*, pp. 73-4.

⁵⁶ Cf. Marshall, *Principles of Economics* (8th Ed.), p. 196. "In England now want of food is scarcely ever the direct cause of death."

fact, judged by her present food-supply, India can be rightly called an over-populated country, and Bengal an over-populated province.

But over- or under-population, it must be noted, is only a relative term—relative to the actual food-supply or, more appropriately, to the standard of living. Inspite of all the criticisms hurled against the Malthusian Law of Population, the substance of the law remains unaffected. Population must keep pace with food-supply. Otherwise men will have to go unfed or under-fed and under-nourished, and will thereafter fall an easy prey to death and diseases. So unless people voluntarily restrict their number there are the merciless hands of Nature to prevent an unlimited increase. It thus follows that high death-rate has been almost an unfailing companion of high birth-rate. Malthusian theory, however, has been modified in that in the modern world the limiting point of population is not the availability of food-supply, but the total National Dividend. That is why a country, even though deficient in food-supply, when found to be in possession of plenty of wealth can support a fairly large number of population with a high standard of living for its members. England is the typical case in point.⁵⁷ On the other hand, a country having vast agricultural resources and an almost inexhaustible food-supply, can maintain a similar percentage proportion of population only at the cost of a considerably low standard of living. That is precisely the case with India. Thus, Great Britain, with an area of 89,041 square miles, supported, according to the Census of 1928, 45 million persons, whereas India, with an area 21 times as large as that of Great Britain, supported, according to the Census of 1931, a population only about 8 times

⁵⁷ This can be seen from the percentages of Great Britain's Food Supplies, which were Home-Grown in 1924-28. Thus, Liquid milk—100; Potatoes—90; Pigmeat other than bacon—82; Vegetables other than potatoes—75; Poultry and game—64; Eggs—50; Beef and Veal—46; Mutton and lamb—43; Apples—38; Cereals other than wheat—28; Cheese—22; Condensed milk—21; Fruit and nuts other than apples and bananas—19; Wheat flour—18; Bacon—14; Butter—13; Sugar—0; Bananas—0; Cocoa—0; Vegetable lard—0. Cohen, *Economics of Agriculture*, p. 45.

larger than that of the latter, and if we take the latest census of 1941 it becomes the maximum of about 9·5 times as large. None the less, Great Britain is far richer a country than India and has a very high average standard of living as compared to that in India. That is, even though Great Britain is greatly lacking in food-supply, she has a greater supporting capacity than that of India although the latter is relatively far richer in food-supply. Similarly, comparing England and Wales with Bengal, it is found that Bengal has an area more than two-fifths as large as that of England and Wales together, but her population, in 1931, was a little more than a quarter as large as that of England and Wales during the same time. Yet while the average Englishman was flourishing in sufficiency of food and general prosperity, the average Bengalee was wallowing amidst hunger, disease and death arising out of insufficiency of food-supply and of poverty of means.

So, if the question is put to us straight: 'Is India or Bengal over-populated!', we would answer forthwith in the affirmative. Judged by the present availability of food-articles and the low income *per capita* as well as the incidence of population per square mile, a survey of which has already been given in this Chapter, ours is an over-populated country. Indeed most of our problems, including almost the perennial starvation haunting over a considerably large section of our population, the death-grip of diseases, low vitality and high mortality rates, and lower expectations of life, are all the consequences of population having outrun both the food-supply and the command over food-supply or the income *per capita*. But does it follow, as some people seem to aver, that the only remedy to this abnormal condition lies in, since there are as yet no effective preventive checks to restrict the population in operation in this country, positive checks in the forms of famine, pestilence, etc.? To this we would say emphatically, 'no'. The term over-population, we may say even at the

risk of repetition, is a relative one, and India is over-populated only relatively, that is, relatively to her present food-supply or the command over food-supply. But, whether judged by the total area or by the potential resources, India, including Bengal, cannot be said to be over-populated. As a matter of fact, if England and Wales can free themselves from scarcity of food as well as from the ravages of mortal diseases, Bengal, and no doubt India too, with an area two-fifths as large and being one of the most fertile regions in the world, and also endowed with vast and various natural resources, can also be completely free from hunger and diseases, and can solve all the problems regarding population *vis-à-vis* food-supply, that have long been worrying her people.

But there is no place for complacency regarding the increase of population. It is no doubt true that science has been almost continuously opening up greater and greater possibilities before us and also providing us with keys to the hitherto undisclosed and undiscovered store-houses of precious materials enhancing thereby the supporting capacity of the land. It is also true that "the orderly evolution of human knowledge justifies us in assuming that science will keep pace in discovering means of expanding opportunities of happy human subsistence". Nevertheless, under given conditions and at a particular place-time continuum there is an optimum number of population which a particular land area can support. If the population exceeds that number there will be a reduction in the standard of living and deficiency in food available per head. Hence arises the need of control of population growth by preventive checks. However science may progress and whatever grand vistas it opens before us, population of a particular area cannot go increasing *ad infinitum*.

Biologically as well as physiologically, too, large bodies are found to be unfit to live. Nature teaches us that. All our giant ancestors which are considered to have roamed over and dominated this earth before the advent of man,



have long since been extinct. Instead we find today man with his little structure lording over all others. Similarly, smaller nations today are dominating a large part of the world, and the bigger countries like India and China live mostly by the sufferance of others. So, it appears essential that a nation, like an animal organism, must not be too big to live an efficient existence.



CHAPTER IV

LAND SYSTEM

I. INTRODUCTORY NOTE

An attempt has been made in this Chapter to give, in brief, an idea of the land system of Bengal—its historical development, present features, defects and suggested remedies. Comparatively more space has been devoted to discussing the historical development in order to clarify the issues regarding proprietary rights on land in India, because a considerable amount of confusion is still found to exist over such rights. The question of proprietary rights on land has long been a subject of great controversy. But it is high time that this controversy were resolved and the confusion cleared. Confusion at this period will worse confound all the future schemes for regenerating our national life. And any scheme of reconstructing the present system of land tenure of our Province must start with clear ideas about the origin and development of the ideas of proprietary rights upon land so that it may be easier to judge the legality and the propriety of various tenures.

II. HISTORICAL BACKGROUND

1. *Hindu System*

A. Notions of Proprietary Rights

According to the ancient Indian sages, earth was a common property like air or water. But a right to portions of it accrued from occupancy. Jaimini, writing many centuries before Christ, says: "Earth cannot be given away as it is common to all."¹ Commenting on this aphorism,

¹ *Na bhūmi syāt sarvān pratyavisistatvāt* (*Mimāṃsa-Sūtras*, Ch. IV, 7, 2).



Savara (5th century A.D.) writes: "Earth is the common property of all human beings; though there may be occupiers of particular portions of it, none can be the owner of the whole earth." Sāyana (14th century A.D.) also commenting on the same observes: "The soil is the common property of all and they (men) through their own efforts can enjoy the fruits thereof. Therefore, although pieces of land belonging to particular individuals may be given away, the earth cannot be given away (even by the King)."²

Thus, two things are evident from the aphorism and its commentaries. *Bhūmi* or land in general was considered to be the common property of all. But at the same time any person could hold a particular plot of land as his own, unmolested, if he cleared it and tilled it. This right of the subjects to the ownership of land was universally recognised by the ancient Hindu Kings. "Private property", says Mitra, J., "in land seems to have been recognised as a sacred right, which even the hand of despotism would rarely violate".³ That the person who first makes a beneficial use of the soil acquires, according to Hindu common law, a right to the possession of land unmolested as long as he meets the due claim of the Crown as to revenue, was recognised in the well-known Great Rent Case, i.e., the case of *Thakoranee Dassi V. Bisweswar Mukerjee*. Dr. Radha Kumud Mookerjee, in his brilliant essay on "Indian Land System" appended to Vol. II of the *Bengal Land Revenue Commission Report*, writes: "Indian society at its start was recognised on the basis of private property in land". Again, "there is no trace in Vedic literature of Communal property of any sort, nor is there mention of communal cultivation".⁴ The notion of communal ownership was, however, not entirely absent. Mookerji himself points out that "the extent of communal control and ownership of land probably applied to what was 'no man's land', the grass land which served

² Cf. Mitra, *Land Laws of Bengal*, pp. 4-5.

³ *Ibid.*, p. 6. Cf. also Lewinsky, *The Origin of Property*, pp. 6-18.

⁴ Mookerji, *Indian Land System*, p. 130. Cf. also Ghosal, *The Agrarian System in Ancient India* (Cal. Univ.), 1930, pp. 81-2.

to separate one plot from another and was used as village common for purposes of pasture for cattle".⁵ And it can hardly be denied that there was an intimate relation between the ownership of lands in general and that of 'no man's land' or of grass land. We know that the significance of joint-ownership of the village commons and pasturage has been belittled by Baden Powell as being altogether of a different category from that of communal ownership. But how grossly mistaken he is will be evident from the following excerpt from Professor Radha Kamal Mukerjee's highly authoritative Readership Lectures on the *Land Problems of India*, delivered under the auspices of the Calcutta University. "The distinction which Baden Powell draws between joint ownership of a village, and the possession of the village commons and grazing grounds and other traces of original clan or village properties, or the custodian of a periodical distribution of the tillage lands or the fallow, is refuted by economic history, which often finds them as inseparable stages in the evolution of property and of early village forms in different countries. To each family a homestead and plots of arable land parcelled out of the common soil, to the community the meadow and the waste—this is the general principle of the village community everywhere, in Japan and Java, in India and Europe, in Fiji and Basutoland".⁶ Again, "Communal land tenure is for the most part confined in India to the waste lands, meadows and pastures along with dues and services of a co-operative village system, which have evolved out of an earlier tribal communism. These seem to be the most characteristic features of early village settlements in India as in other countries".⁷

To a superficial reader the two leading opinions represented above may appear as conflicting or even contradictory. But on going into the deeper strata of facts one would

⁵ Quoted by Mookerji, *op. cit.*, from Macdonell and Keith, VI, I, 100. See also Ghosal, *op. cit.*, p. 82.

⁶ Mukerjee, *Land Problems of India* (1933), pp. 16-7.

⁷ *Ibid.*, p. 15.



find that the two views reflect but two different aspects of the same question. The fact that in Vedic literature there is no mention of communal ownership in general does not necessarily mean that the Aryans, had not had the particular system in vogue amongst them. On the other hand, the traces of joint ownership that were found regarding "no man's land" and pasturage in Aryan villages in India go in favour of the contention that the two—communal ownership in general, and joint ownership of "no man's land" and the grazing grounds—were but two inseparable, though different, stages in the evolution of property. When the Aryans settled down in India it is highly likely that they were in the later and the advanced stage. But in the Dravidian villages of India both the stages were and, as shown by Dr. Radha Kamal Mukerjee, are still, to a great extent, to be found. Even in non-Dravidian villages vestigial remains of communal ownership linger in some form or other. Such remains are found not merely in the Moslem tribes, such as those of the North Western Frontier Province, who came later into India, but also in villages, who trace their descent directly or indirectly from their ancient Aryan prototypes.

True, the notion about the origin of proprietary right in land was firmly established in India at such early times, but such right was limited to the usufruct and was not extended to the soil. The notion arose not out of any theoretical considerations but as a matter of expediency and there can be no doubt that the sages took the most practical view of proprietary right. The Aryans in India found themselves masters of a vast area of fertile land which was in all probabilities then covered with virgin forests, and which they gradually cleared up and utilised for agriculture. But it seems that regarding land they applied the same principles of proprietary right as had been recognised in the case of hunting. It was the well-known rule in hunting that wild animals belonged to them who first pierced those animals. Similarly it was held that the first person who

made the beneficial use of a particular plot of land was entitled to enjoy the fruits thereof.* That is, due recognition was given to the rights of labour. A man was allowed to enjoy the fruits of his labour (*phalam tasyaiba*) no matter in whatever form such labour might have been incorporated. But that right did not extend beyond the enjoyment of the fruits of labour.* It did not cover those which were free gifts of nature. The latter were the common property of all.

Thus, although the notions of proprietary rights were current in India as early as the Vedic age, they did not extend to an absurd length. These notions were indeed naive. But those were the most correct notions and were founded on sound principles. Labour alone was recognised to have given rise to the rights of possession. Whatever might have been the original conception of proprietary rights of the Aryans before they had come to India, it is a fact that after having planted themselves securely in India they applied to land the most rudimentary ideas about individual proprietary rights then applicable in the case of hunting. As has already been said, this was obviously necessary for practical reasons. "The real reason for allowing private property in land was the stimulus it gave to the growth of agriculture at the first stage of economic and social progress." Thus, the growth of agriculture was the objective and the recognition of private property in land was thought to be the best device to reach that objective.¹⁰ It is no wonder, therefore, that the rights of inheritance, as pointed out by Dr. Radha Kumud Mookerjee, were

* *Sthānūchchedasya kedāramāhū salyabato mrgam* (Manu, Ch. IX, V. 44). Medhātithi, in his commentary on this verse of Manu, makes it further clear in the following words :

Sthānūrgūchhagulimalatādi prarūḍho yatra bhabati tam chhinatī ya sa sthānūchcheda tasya tat kshetraṁ yena prarūḍhogūlmalatādibeerudhas-chhittvā bhūmi kshetrikrita tatra karsanabapanajātam phalam tasyaiba.

¹⁰ Ghosal also observes that "it was not a permanent right of ownership but mere possession". *Op. cit.*, p. 85.

¹¹ Cf. Mukerjee's *Land Problems of India*, p. 3. "In India the village communities established a balance between individual and collective rights which was conducive to agricultural efficiency in its adaptations to social and geographical conditions."



recognised in the Vedic period. The recognition of these rights were but the natural and logical step following the recognition of private proprietorship.

Individual persons were, therefore, recognised to be the proprietors of land they actually cultivated, even in the early Vedic age. It should, however, be noted that the unit of proprietorship was the family and not each and every person who first cultivated land. Each family was the proprietor of land held by it although such land could be owned only by the head of the family who could bequeath or otherwise transmit it to his heirs.

But the nature and extent of these proprietary rights have been subjects of great controversy. Sir Arthur Phillips, in his Tagore Law Lectures, 1874-75, definitely speaks of this controversy. He says: "Manu says that 'sages pronounce cultivated land to be the property of him who cut away the wood, or who cleared and tilled it', a general principle which has been recognised in Germany, Java and Russia, and indeed in most countries, and which is expressly enunciated in Mahomedan Law also, but which does not enable us to advance in our present enquiry. It leaves the question what right of property is acquired, whether absolute and exclusive, or only limited,—whether in the soil itself or only the right to cultivate it."¹¹ We, however, agree with Mitra, J., that the right was originally not extended to the soil but only to the usufruct and that while a particular plot of land could be the object of individual holding of him who first tilled it, land in general was recognised to be common property of all. Although land could be privately owned by plots, the interest of the whole community was bound up with land in general. An individual owner by virtue of his rights of ownership could not use land in a way that would make the community a loser. "As a general rule the great field was divided into plots corresponding in number to that of the heads of houses in the villages; and

¹¹ Arthur Phillips, *The Law Relating to the Land Tenure of Lower Bengal*, p. 4.

each family took the produce of his shares. But there was no such property as against the community, as we are accustomed to in England. We hear of no instance of a share-holder selling or mortgaging the village field to an outsider; and it was impossible for him to do so at least without the consent of the village council."¹²

The person in possession of a plot of land was bound to cultivate it and Indian sages have laid down strict rules with a view to enforcing cultivation. Nārada says: "When a field is abandoned by its owner and the same is cultivated by another without opposition, the cultivator is entitled to the whole of the produce and the owner would not get back the land without paying the cost of the clearance and cultivation."¹³ This rule clearly shows that it is labour and not mere ownership that determines the right to enjoy the products of land. As a matter of fact, ownership on land arises by virtue of expending labour by a person year in and year out over it. An owner forfeits his right to hold a particular plot of land if he continuously fails to cultivate it for a number of years. If in the meantime any other person tills it, then he, on the same principles by which the original cultivator became the proprietor of that plot, becomes the new proprietor. This is what is known in the Roman Law as the acquisition of rights on land through adverse possession ripened by prescription. There is no doubt that the Indian sages were conversant with this. Mitra, J., writes: "It is quite clear that during the long period in which the *Sutras* were composed by the venerable sages (e.g., Manu, Atri, Vishnu, Harita, Yājnavalkya, Usīna, Angira, Yama, Apastamba, Kātyāyana, Vrihaspati, Satapata, Vasistha, Nārada and Parāsara) . . . rights of possession and effect of adverse possession as creating prescriptive rights were all understood and recognised."¹⁴ It is evident, therefore, that the limits of proprietary rights were known to

¹² Rhys Davids, *Buddhist India*.

¹³ Quoted by Mitra, J., from *Narada Smriti*, Ch. XI, 24. *Op. cit.*, p. 13.

¹⁴ *Ibid.*, p. 18.

them. Private rights were allowed on land because these were deemed to have fostered communal good. Communal ownership was similarly prescribed where it was needed. The grazing ground, for example, was common. "Each village had its grazing ground for the cattle of all its residents and cultivators. It was common property and none had the right to appropriate any part of it for purposes of cultivation." It was, no doubt, the wisest course, because grazing ground, if allowed to be held in private possession, would have every possibility of being cultivated for greater profit and consequently the conditions of the cattle would have deteriorated for want of adequate fodder. The custom was scrupulously observed even as late as the seventh and sixth century B.C. Rhys Davids, the eminent historian, writes: "No individual could acquire, either by purchase or inheritance, any extensive right in any portion of the common grassland or woodland. Great importance was attached to these rights of pasture and forestry."¹⁵

A further proof of the limited character of proprietary rights in this period is found in the fact that such rights were originally non-alienable even though they were heritable.¹⁶ In course of time, however, these rights became alienable. This change marked another leap forward in the evolution of the ideas of proprietary rights.

Thus, it is clear from what has been said above that proprietary rights of the original cultivators were not of an unlimited nature. Firstly, such rights could be acquired in respect of usufruct only. Secondly, there were the implied rights of the community to interfere with whenever the cultivators failed to till the land in their possession. Thirdly, State dues were there. Professor Mukerjee writes: "Private property in land was limited by its established obligations to the State in the shape of dues and taxes or *bali* payable to it."

¹⁵ Rhys Davids, *op. cit.*, Ch. III.

¹⁶ Mitra, J., *op. cit.*, p. 21.

B. Rights of the State

So far as the rights of the State or sovereign are concerned, the Hindu sages were unanimous that the sovereign was not the proprietor of the soil. "He was entitled to a share of the usufruct of the land in the occupation of his subjects, not because he was the owner, but because a share was payable to him as the price for the protection he afforded to life, liberty and property. The records of Hindu thought from the earliest times point to this conclusion."¹⁷ The King was entitled only to *bali* or tax. Nārada defines *bali* in his *Smṛiti* as the reward of a King for the protection of his subjects (*bali sa tasya bikita prajāpālana-betanam*). The later sages also support this theory of the King's right. Manu, Yājnavalkya, Apastamba, Vasistha, Baudhāyana and even Parāsara are the prominent of these sages. In the *Sūkranīti* also the King is regarded as the servant of the subjects with his taxes as his fees.¹⁸ Moreover, the King could not make a gift of his kingdom. It is stated in the *Satapatha Brāhmaṇa* that the earth itself said—"No mortal must give me away."¹⁹ Jaimini lays down in his *Pūrva-Mimāṁsā*: "The King cannot give away the earth because it is not his exclusive property but is common to all beings enjoying the fruits of their own labour. It belongs to all alike."²⁰ Commenting on this passage Savara says: "The King cannot make a gift of his kingdom as it is not his, as he is entitled only to a share of the produce by reason of his affording protection to his subjects." Sāyana adds to this: "A King's sovereignty lies only in his punishing the wicked and protecting the good (*Dūstasikshā sistaparipālanārtham rājna ishitritvam smṛtyabhipretam iti*). Nor is the land his property (*na rājnabhūmirdhanam*), for what is yielded by land as the fruit of labour on the part of all beings must be enjoyed

¹⁷ *Ibid.*, p. 8.

¹⁸ Cf. Ghosal, *Hindu Revenue System* (1929), p. 18.

¹⁹ Cf. Rhys Davids, *op. cit.*, Ch. III.

²⁰ Cf. Colebrook on the *Mimāṁsā Philosophy*.



by them as their own property (*kimtū tasyām bhūmou svakarmaphalam bhūnjānānam sarvesām prāninām sādhāranam dhanam*).²¹

The rights of the sovereign were deemed not to have altered very much even in respect of territory acquired by conquest. Srikrishna Tarkālankar, in his commentary on the *Dāyabhāga* of Jimutvāhana, says: "By conquest and other means a King acquiring a kingdom has no right over his subjects than that of collecting taxes."²² The *Vyāvahāra-Mayūkha* writes: "Even in the case of a conquest, the property of the conquered in their houses, lands, and other does not pass on to the conqueror but only the taxes due from these. The ownership of village and field belongs to their respective owners and not to the conqueror whose right is restricted to the collection of taxes."²³ But in purchases from the owners of land, the ownership of house, field, and the like, is transferred to the purchaser.²⁴ Srikhanda Deva in his commentary on the *Mimāṃsā-Sūtras* and Mādhavācharya in his comments on *Jaimini-Sūtra* speak in the same strain.

According to the ancient Indian sages, the King had very limited rights over his subjects. He was not autocratic and absolute but was, on the one hand, subject to the control of the Brahmins or philosophers and, on the other, was bound by an obligation to respect and preserve the rights of the subjects. He was appointed, either expressly or in an implied way, by the people so as to protect them from external aggression as also from internal disturbances. He possessed the right to collect taxes in order to discharge his obligations properly. The following extract from Kautilya's *Arthasāstra* unequivocally lends support to this view: "People suffering from anarchy", it observes, "as

²¹ Cf. Mitra, *op. cit.*, p. 10.

²² *Rājyāntarādhikārīna sakāshāt anyanṛpatinā krile rājyāntarādon vikretrsvatvasajatiyah karagrahānopayogi svatvameva tasva jāyate.*

²³ *Tatgrāmākshetradou svatvam tū tattadbhousmikādināmetva. Rōṣṇām tū karagrahānamātram.*

²⁴ Quoted by Mookerji, *Indian Land System*.

illustrated by the proverbial tendency of a large fish swallowing a small one, first *elected* Manu . . . to be their King; and allotted one-sixth of the grains grown and one-tenth of merchandise as sovereign dues. *Fed by this payment, Kings took upon themselves the responsibility of maintaining the safety and security of their subjects, and being answerable for the sins of their subjects* when the principle of levying just punishments and taxes has been violated. Hence hermits, too, provide the King with one-sixth of the grains gleaned by them, thinking that '*it is a tax payable to him who protects us.*'²⁵ Thus, the idea of social, or rather political, contract was definitely known in India in Kautilya's time. The King was elected to protect the people from anarchy, and, in return, he was entitled to a tax. Kautilya, however, is not the only authority dealing with the contractual obligations of the King. The *Smṛti* writers also hold the same view.²⁶ As for example, Parāsara says: "The King receives taxes and, therefore, he should protect his subjects from these and others."²⁷ Our sages pursued this theory to its logical end and did not make any hesitation to apply the same theory even in respect of the conquered territory. They were not in the least swayed by greed and lust of conquest so as to devise one law for themselves and quite the contrary for those who unfortunately lost their freedom to them.

Regarding, however, the amount of the King's share in the produce from land there is found no unanimity. Most of the text-writers hold it to be one-sixth, but in some cases one-eighth, one-tenth and even one-twelfth are considered as the proper shares. Vasistha²⁸ and Vishnu²⁹ fix the King's share of the agricultural produce at the uniform rate of one-sixth (*prajābhyo-valyartham samvatsarena dhān-*

²⁵ *Arthasāstra*, Book I, Ch. XIII. Translation by R. Shamastry. Italics are mine.

²⁶ Cf. Ghosal, *op. cit.*, pp. 100-102.

²⁷ *Aitrāpyūpadravāñ rājā taskarādi samādbhabāñ, sahitrakshet sarvalo yatnāt yasmāt grhnātyasoukarāñ.*

²⁸ Ch. XIX, 26-7.

²⁹ Vishnu, III, 22, 23.

yata sastamamshamādadyāt). Gautama prescribes three rates—one-sixth, one-eighth and one-tenth—according as the quality of the soil is good, middling and bad.³⁰ Manu also speaks of three rates—one-sixth, one-eighth and one-twelfth—to be determined according to the fertility of the soil (*dhānyānāmasto bhāga sastho dvādasa eva vā*).³¹ Kautilya fixes the share of the King at one-fourth *dhānyānām chaturtham aṁsam*).³² He, however, lays down certain conditions. The King may demand of his subjects one-third or one-fourth of their grain only when "he finds himself in a great financial trouble and needs money", and, secondly, he may make this demand only "in such parts of his country as depend solely upon rain for water and are rich in grain". "He shall never demand of such of his subjects as live in tracts of middle or low quality", nor of people who are engaged in certain gainful business, nor, again, "of people who live on the border of his kingdom or who have not enough subsistence."

It is evident, therefore, that the King had an interest in land as much as he was entitled to a share of the agricultural produce in return for his services to the community. He was not the owner of the land even though such land had been acquired by him through conquest. He, however, possessed the right to interfere on behalf of the community as a whole whenever it was found that any person holding land failed to cultivate it either himself or with the help of others. This is implied in the measures suggested by Vyāsa, Nārada and Yājnavalkya to deal with any failure of the owners or possessors to cultivate their lands. Moreover, as Manu says, the King was the "lord of all". V. 39 of Chapter VIII lays down that the King is entitled to a half of the mineral wealth for the protection of mines and also for his overlordship.³³

³⁰ Ch. X, V. 24.

³¹ Ch. VII, V. 130.

³² *Arthasāstra*, Book V, Ch. II.

³³ *Nidhinanta pūrṇānām dhātūnāmeva cha kshitou, ardhabhāg rakshanādrāja bhūmeradhipatirhi sa.*

James Mill, who is one of those British writers who took great pains to show that "the sovereigns in India had not only the ownership, but all the benefit of the land", renders the above verse of Manu as follows: "Of old hoards and precious minerals in the earth, the King is entitled to half by reason of his general protection, and because he is the supreme lord of the soil."²⁴ Mill here substitutes, as he himself says, the word *supreme* for the word *paramount* used by Sir William Jones, and this he does to suit his own purpose. It is most regrettable that the British historians and writers have, in most cases, failed to do proper justice to India in their writings. Indeed, Mill's *History of India* contains a plethora of misstatements and misrepresentations about India and her people. It is no wonder, therefore, that Mill would try to build facts suited to his own conclusion. It was essential for the early British historians to prove that the sovereign in India was the proprietor of the soil in order to show that the British sovereign in India did nothing improper in appropriating all the rights over the soil to itself overriding all other interests thereon. Mill holds that "the property of the soil resided in the sovereign; for, if it did not reside in him it will be impossible to show to whom it belonged."²⁵ This, however, appears to be very queer logic. Actually it has been possible to show to whom did the property of the soil belong in India, and it has been proved beyond all shadow of doubt that the sovereign was by no means the proprietor of the soil. We have quoted enough authorities to show this.

According to the above-mentioned verse of Manu, the King was really the lord, paramount or overlord in his domains. This did not mean that he was the owner of all the lands situated within his kingdom. This overlordship of the King over land had no conflict with the proprietary rights of the family since, as Dr. Radha Kumud Mookerji points out: "The distinction between the political rights

²⁴ Mill, *History of India*, Vol. I, p. 275.

²⁵ *Ibid.* p. 265.



of the Crown and the individual rights of ownership was understood in these early days."³⁶

C. CONCLUSION

It appears, therefore, that even at the earliest Aryan period three parties were interested in land—the cultivator, the community, and the King, and the ownership of land was divided amongst them.³⁷ "Intermediate tenures were apparently unknown in earlier days."³⁸ These possibly came into existence in a more developed state of society. Mookerji, however, shows in his *Indian Land System* that the earliest examples of land transactions in India are found in the gifts of land made by Kings to their preceptors and to the Kshatriyas in reward for the latter's services. "These were", to quote his exact words, "in most cases grants of a superiority, creating India's first landlords". But it should be remembered that these so-called landlords were granted merely the superior interest of the King. The rights of the cultivators could not have been least affected by them. "What happened in such cases was that the King granted not the land (he had no property in the land), but the tithe due by custom, to the government as yearly tax. The peasantry were ousted from no one of their rights".³⁹ The King himself having no proprietary rights on land, the said landlords did not acquire any such rights from his gifts. So, we may conclude with Professor Mukerjee that "the soil in India belonged to the tribe or its subdivision—the village community, the clan, or the brotherhood settled in the village—and never was considered as the property of the King as has been assumed by many writers".⁴⁰

³⁶ Mookerjee, *Indian Land System*.

³⁷ Cf. Hopkins, *India Old and New*, p. 221. He held that while the land revenue in Ancient India was a tax, the ownership in land was divided between the king and the individual or the family.

³⁸ Cf. S. C. Mitra, *op. cit.*, p. 12.

³⁹ Rhys Davids, *op. cit.*, Ch. III.

⁴⁰ Mukerjee, *Land Problems of India*, p. 16.

2. *Mahomedan System*

Even though the practical deviations were many, the theoretical backgrounds of the ownership of land were such when the Moslems came to India. They had the same principles regarding the acquisition and ownership of land. "The first cultivator was the proprietor by virtue of his having brought the land into cultivation".⁴¹ He was, however, bound to pay tithe and, in certain cases, tribute. In these respects there was a great similarity between the principles of the new-comers and those of the natives. But there was a difference in respect of land acquired by conquest. The principle of the new-comers was that the conqueror was the proprietor of the conquered land.⁴² He possessed the right either to distribute it among the Moslems or to leave it to the original proprietors, levying upon them a capitation tax called the *zezyat* and also a tribute upon their lands known as *khiraj*. The tithe or *oosher* was to be imposed only upon the believers. *Khiraj* was to be levied according to the nature of the land.

But the Moslems did not apply these principles to any marked degree in India. The existing land system was not affected very much by the change of rulers.⁴³ Only some small quantities of land might have been given to soldiers as *jaigirs* and *aymas*, but these were mostly waste lands.⁴⁴ They imposed the *khiraj*, but in India, says Mitra, J.. "Khiraj was never formally levied although an attempt was made to do so by Emperor Alauddin in the beginning of the 14th century". The *Khiraj* that was imposed "did not deny the existence of property in land and take away the proprietorship of the cultivator. His right was alienable and the lands cultivated continued to be the "property of the inhabitants who might lawfully or otherwise

⁴¹ *Hedaya*, Book IX, Ch. VII. Quoted by Mitra, *op. cit.*, p. 25.

⁴² "All the land was vested in the King. He could give and take back land whenever he liked. Vested interest in land, therefore, could not arise." Pant, *Commercial Policy of the Moguls*, p. 59.

⁴³ Cf. Moreland, *Cambridge History of India*, Vol. IV, p. 449.

⁴⁴ Mitra, *op. cit.*, p. 23.

dispose of them".⁴⁵ The sovereign was entitled only to a share of the produce, which could be even as much as a half".⁴⁶ Moreover, the *Khiraj* was soon commuted into money rent. The commutation of the sovereign's share, according to Mahomedan law, implied the loss of sovereign's proprietary right. The ultimate result was, therefore, the same as if the King was not the proprietor of the soil but was merely entitled to rent.

The principal reason, however, why the ancient land system of India almost remained in tact was that after the fall of Prithwiraj most of the small Hindu principalities surrendered to the new-comers and they were allowed to retain their respective holdings on their agreeing to pay *Khiraj* or tribute. The then position is very ably described by Mitra, J. He writes: "It was not until the days of Akbar that any serious effort was made for the collection of the *Khiraj* direct from the cultivators. Even then the hereditary chiefs who had long ancestries to tell were not disturbed. They got *sanads* which provided for payment of nominal sums as rent (*Khiraj*). The apathy and the carelessness of the Nawabs brought about a system of non-interference with internal management, whether fiscal or judicial, of the various provinces of the empire, and the Hindu *rājās* or zemindars, call them by what name you will, took the fullest advantage of their position".⁴⁷ To quote again: "The Hindu *rājās* and zemindars, though theoretically merely collectors of land revenue, had to perform almost all the functions of the sovereign. They heard and decided cases, civil and criminal, and enforced obedience to their decrees and sentences in the same way as sovereigns. They had their own law officers or pundits. The police administration was under them. In fiscal matters, their authority was supreme, the interference of the ruling power being really few and far between. The

⁴⁵ Baille's *Land Tax of India*, p. 15. *Hedaya*, Book IX, Ch. VII.

⁴⁶ Mitra, *op. cit.*, p. 24.

⁴⁷ *Ibid.*, p. 25.

necessary result was the practical continuation of the Hindu system". Although Raja Todar Mall, the celebrated Finance Minister in Akbar's Government, made attempts to settle directly with the cultivators, in Bengal his scheme was only partially carried out and even those zemindars who had been ignored were soon restored to power.

To ascertain the rights of the cultivators at this period involves questions of great difficulty. We, however, quote from the same authority to show the exact nature of such rights. "The distinct revival, in the reign of Akbar, of the old Hindu system under his Hindu minister, would seem to imply a revival of the principle which distinctly recognised the right of the cultivators to hold on and enjoy the usufruct, and even to alienate and sublet. It was, to all intents and purposes, a proprietary right, subject to the payment of definite share of the produce, which, since Raja Todar Mall's settlement, could be called customery rent. Ejectment was unknown except for non-cultivation or continuous non-payment of rent. Competition-rent was never thought of. The very fact that *abwabs* or illegal cesses were now and then levied, shows that the raiyats believed that rent was fixed and unalterable except under very peculiar circumstances. To use the words of the framers of the Regulation Code of 1793, 'the ruling power is entitled to a certain proportion of the produce of every *bigha*⁴⁸ of land' (Preamble to Regulations XIX and XXXVIII of 1793)—not, however, as the *proprietor* of the soil but as responsible for the protection afforded to the subject."⁴⁹

Along with the general principles of landholding, the principle of assessment remained the same. It was the sharing of the produce. In ancient India the usual share of the King generally varied between one-sixth and one-fourth, of which the former was the more common. In mediaeval India, the rate was raised by the Moslem rulers. It, then,

⁴⁸ About $\frac{1}{3}$ acre.

⁴⁹ Mitra, *op. cit.*, pp. 28-9.



varied as between one-third⁵⁰ and half, the latter being fixed as the standard in Aurungzeb's time.

3. *British System*

A great change, however, came in since the East India Company obtained from the then titular Emperor of Delhi the *Dewani*, i.e., the revenue administration of Bengal, Bihar and Orissa. They were apparently ignorant of the ideas of proprietary rights that had been recognised throughout the Hindu period and were but little altered in the Mahomedan period. Consequently, "they were," as Mitra, J., observes: "compelled to introduce in India a system of judisprudence with rules of procedure and notions of proprietary right, which may well be characterised as a parody of what they then had in England".⁵¹ In taking this step, they were, no doubt, to a certain extent misled by the Mahomedan doctrine; but they did not care to observe that that doctrine had very little impression on the actual land system of India.

Regarding the proprietary right of the government, Justice Mitra writes: "The English in India started with the assumption that 'all the soil belonged in absolute property to the sovereign, and all private property in land exist by his sufferance'.⁵² This was the doctrine of Abu Haneefa, and accorded with the English theory that 'the *proprietas* or actual ownership of the land' always resided 'in the sovereign'. The existence of private property in land which is the doctrine of Hindu jurisprudence and which even the Mahomedan Government in India did not put out of sight, was entirely ignored. With this idea the Government in 1793 transferred in perpetuity a vast and the unmeasured quantity of land to a class of men who were

⁵⁰ According to the Moslem Law, the King's share was one-fifth of the gross produce, but the Moguls took one-third. Pant, *op. cit.* Ch. III.

⁵¹ Mitra, *op. cit.* p. 29.

⁵² Quoted by Mitra from Maine's *Village Communities*, 7th ed., p. 104.

known to be zemindars, and the property in the soil was formally declared to be vested in them (Preamble to Reg. II of 1793). The remaining quantity of land, cultivated or waste, continued to be the property of the State".

Thus, the Englishmen began their history in India with their first blow directed at our land system, which brought wide repercussions on our entire economic, political and social structure. Consciously or unconsciously, they committed two fundamental mistakes with regard to the land revenue policy. They assumed that the Government was the owner of all property and, secondly, they transferred to the zemindars this supposed proprietary right as if the cultivators were no body and had, therefore, no right to hold land. Their position was relegated to that of mere tenants-at-will under the zemindars. It had been a long history of terrible suffering and painful miseries before the cultivators' most essential rights as against the zemindars were first recognised by the Government.

The Preamble to the Regulation II of 1793 declared that "the property in the soil was formally vested in the landholders". But there is a great controversy as to what was the exact status of the landlords prior to the enactment of the Permanent Settlement Regulations. Opinions vary as widely as the poles. On the one extreme it is pointed out that the zemindars were mere revenue farmers and tax-collectors; while, on the other, it is said that they were hereditary landlords holding proprietary rights over land in their possession. Neither of these extreme views is borne out by facts. The actual status of those who were given the common name of Zemindars in the Mahomedan period can be classified in no less than four heads noted below :—

The *first* class consisted of the "original independent chiefs" of the country, who paid only nominal allegiance to the Imperial Government, either Hindu or Mahomedan. In this class were included the Rajas of Pachete, Ramgarh, Assam, Tipperah, Cooch-Behar, Bishnupur and Birbhum.



The *second* class was formed by the "old established landholding families". They came into existence during the Mahomedan period through the favour or sufferance of the Moslem rulers. The Rajas of Rajshahi, Dinajpore, Burdwan, Nadia and Jessore who were *de facto* rulers in their estates and paid only a fixed land-tax to the ruling power were included in this class.

The *third* class consisted of the collectors of revenue and was the most numerous class. Their families had held land under the Mahomedan Government officers for collecting land revenue, which tended to be hereditary after several generations.

Lastly, there were the revenue-farmers who had been entrusted with the charge of the collection of revenue since the grant of the Dewani. They were also known by the general term "Zemindars".

Thus, we see that although there were certain independent chiefs and landholding families holding land of their own, the revenue-collectors and tax-farmers formed by far the greater number of those who were collectively called "zemindars". The Regulation II of 1793, however, conferred proprietary rights upon all the landholders including this larger body of mere revenue-collectors and farmers, and thereby "obliterated the differences in the customary status which had grown out of differences of origin".³³

4. Summary

From the history of the acquisition and ownership of land, as given in the preceding pages, it follows that proprietorship in land in the Hindu period had, both in theory and practice, been given to the actual cultivators. In the Mahomedan period the Government was in theory the

³³ Mukerjee, *op. cit.*, p. 35.



proprietor of land although it was not actually applied to any considerable extent. The British Administration wrought both theoretical and practical changes in our land system. Proprietorship was given to persons, most of whom were originally mere tax-collectors and revenue-farmers. As to the original independent chiefs and the old established landholding families, it may be true that their status was considerably lowered by the Permanent Settlement Regulations. But whatever might have been the original status of the so-called zemindars in general, the Permanent Settlement Regulations committed a great act of injustice by denying the cultivators their due rights. Needless to say, proprietary rights should have gone to the actual cultivators. Not to speak of the tax-gatherers and the revenue-farmers, even the independent chiefs and the established landlords could not have possessed absolute proprietary rights. Their rights obviously did not exceed those possessed by the ancient Kings as the protectors of the soil, and the fact that these ancient Kings or their descendants had to surrender before the Mahomedan rulers and pay tribute to the latter as a result of which they were allowed to remain undisturbed, did not give them the right to arrogate to themselves all the rights upon land.

On the other hand, when we say that the proprietary rights did go or should have gone to the actual cultivators we do not mean that they were or could ever be the absolute masters of their domains. It should better be remembered that much of the controversy regarding the proprietary rights upon land has been due mainly to wrong or vague ideas as to the exact imports of proprietary rights. Proprietary rights have usually been taken to mean absolute ownership of land and the uncontrolled right to use it or to deal with it in any way whatsoever. But there can be no greater mistake than this. Proprietary rights on land actually mean the right to the usufruct which is the product of one's labour, the right to pass it on to the descendants and, in certain cases, the right to transfer by way of commercial or other



transactions. There is no reason to believe that the Indian sages while speaking of the proprietary rights meant anything more than these. As we have already stated, the whole community is interested in land in general. Particular portions of it may be objects of private holding whenever any person or group of persons spend his or their labour on them. But such holding cannot and do not make them absolute masters of their respective plots of land. They are entitled to enjoy the fruits of their labour and can, in their absence, make over these fruits to their immediate descendants. But they cannot use their land in a way prejudicial to the interest of all. In such cases either the community or rather the government on behalf of the community, shall interfere in order to prevent the motives of private interests from being extended too far. The actual cultivators, therefore, hold land subject to the payment of a share to the government for the protection it affords and also subject to the final authority of the community to interfere whenever land is found to be used in a way that is likely to entail loss upon the society. In short, individual man holds land in trust and on behalf of the community and is allowed to hold it so long as he discharges his responsibilities properly. But as soon as he fails in his duties, he is liable for a breach of trust and so to forfeit his rights upon land.

III. PERMANENT SETTLEMENT

1. *Considerations that led to the Introduction of the Permanent Settlement*

It is beyond the scope of the present work to discuss the history of assessment in details prior and subsequent to the enactment of the Permanent Settlement Regulations. We would, however, deal, in very brief, with the principal considerations that led to the introduction of the Permanent Settlement in order to show that it was a product of certain



abnormal conditions prevailing at the time of its enactment. The scheme of settling once for all the assessment upon land was adopted in the expectation that it would meet certain immediate needs of the foreign rulers. A distant view, however, was not altogether absent. But this too was calculated to safeguard their interest in future. The good that any section of the natives was expected to reap out of the scheme was merely incidental and unavoidable. Even if such beneficence to a particular class or section was seriously aimed at, its ulterior purpose was to fortify the basis of the foreign rule in the country.

The considerations can broadly be divided into two classes—political and economic. The most important of political considerations was the creation of a class of vested interests from amongst the natives of this country, which would act as the bulwark of the British Empire in India. As Lord Cornwallis said: "the proprietors of the lands should be attached to us from motives of self-interest. A landholder who is secured in the quiet enjoyment of a profitable state could have no motive for wishing for a change. On the contrary, if the rents of his lands are raised in proportion to their improvement, if he is liable to be dispossessed should he refuse to pay the increase required of him, or if he is threatened with imprisonment or confiscation of his property on account of balances due to Government upon an assessment which his lands are unequal to pay, he will readily listen to any offers which are likely to bring about a change that cannot place him in a worse situation, but which holds out to him hopes of a better".⁵⁴ The Secretary of State for India, in the course of a Despatch to the Government of India dated the 9th July, 1862, stated: "Her Majesty's Government entertain no doubt of the political advantages which would attend a permanent settlement. The security and, it may almost be said, the absolute creation, of property in the soil which will follow from limitation in perpetuity of the demands of the State on the owners of

⁵⁴ Quoted by Dr. Radha Kumud Mookerji, *op. cit.*



land, cannot fail to stimulate or confirm their sentiments of attachment and loyalty to the government by whom so great a boon has been conceded, and on whose existence its permanency will depend". Again, "it is also most desirable that facilities should be given for the gradual growth of a middle class connected with the land, without dispossessing the peasant proprietors and occupiers. . . . When such men acquire property and find themselves in a thriving condition, they are certain to be well affected towards the government under which they live. It is on the contentment of the agricultural classes, who form the great bulk of the population, that the security of the government mainly depends. If they are prosperous, any casual outbreak on the part of other classes or bodies of men is much less likely to become an element of danger, and the military force, and its consequence expense, may be regulated accordingly".

Of the economic considerations, the necessity of an adequate provision for the financial needs of the East India Company was of supreme importance. The fixing for ever of the land-tax payable by the zemindars to the Government was expected to yield a State and measurable income to the latter, which was then sorely needed in order to meet the huge expenditure of the great military and civil establishments of the Company as also to pay dividends to its proprietors. The Company agents acted up to the well-known Bengali adage "to fry fish with the oil pressed out from the fish itself", and conducted its wars of conquest of our land at our cost. As R. C. Dutt writes: "In India an empire was being acquired, wars were waged and administration carried on at a cost of the Indian people without the British nation contributing a shilling." The British Government were then not in a position to give the Company any monetary help as they themselves were involved in war on the Continent. Such help came to them from "the resources furnished by permanently settled Bengal". When the British established their rule in the Provinces granted to

them in *Dewani*, as we have already said, they completely overlooked the ancient notions of proprietary rights and the principles of assessment. They assessed the land so heavily that, in the words of Burke, "the country had turned into a desert", and "the assessment materially contributed to the fatal consequences of the Great Famine of Bengal of 1770. The British in Bengal, like their prototypes of Peru and Mexico, were bent on amassing wealth and growing rich in as short time as possible".⁵⁵ The result was, when Cornwallis came to India he found "an empty treasury, the best of the lands grown waste and out of cultivation". This miserable state of things loudly called for some remedy, and the remedy was found by the then Governor-General of India in what had long before been proposed by Sir Phillip Francis, that is, in the Permanent Settlement. It was expected that by permanently fixing the *jama* or assessment from land the State would get an estimable and secure source of income, while at the same time it would be free from day to day troubles and responsibilities arising out of and in connection with land. Moreover, the possibility that the zemindars out of a desire to reap greater and greater profit from land would increasingly exert themselves in the improvement of cultivation, was always present in the mind of Lord Cornwallis. "Apart from the financial needs of the Company", writes Mookerji, "Permanent Settlement was resorted to as an economic measure to speed up the economic development of the country on the basis of Agriculture as its main industry".⁵⁶ It was expected, as the Court of Directors stated, that "a permanent settlement must contain in its nature a productive principle, and that the possession of property and the sure enjoyment of benefits derivable from it will awaken and stimulate industry, promote agriculture, extend improvement, establish credit, and augment the general wealth and prosperity.... the advantages of proprietary rights and secured profits in the

⁵⁵ Bose, *Rise of the Christian Power in India*, p. 281.

⁵⁶ *Indian Land System*, p. 220.



landholder will, on his part, afford means to support and incite exertions.... In every step of this progressive work, property becomes of more value, the owner of more importance, and the system of additional strength".⁵⁷

It is well-known today how little these hopes and expectations of Cornwallis and of the Court of Directors were realised in course of time. Nevertheless, the immediate objectives of the Permanent Settlement had been attained. The Company found a secure source of income with which they carried on their administration and wars of conquest. The benefits that a section of people of this country received out of the Regulation, as we have already stated, were merely a few crumbs thrown at them with a view to winning them over on the side of their masters and, with their help, to stemming any possible future tide of disaffection and disorder. For, it was originally not the intention of the British in India to create a leisure class who, being assured of their livelihood, would demand to be ranked as equal with their rulers. It is evident from the following extract from a Minute of William Thackeray, a member of the Madras Council during Bentinck's governorship: "It is very proper that in England, a good share of the produce of the earth should be appropriated to support certain families in affluence, to produce senators, sages and heroes for the service and defence of the State.... the leisure, independence, and high ideas, which the enjoyment of this rent affords, has enabled them to raise Britain to the pinnacle of glory. Long may they enjoy it;—but in India, that haughty spirit, independence, and deep thought, which the possession of great wealth sometimes gives ought to be suppressed. They are directly adverse to our power, and interest.... We do not want generals, statesmen and legislators: we want industrious husbandmen".⁵⁸

⁵⁷ Vide the Despatch from the Court of Directors to the Governor-General-in-Council in Bengal, (Revenue Department) dated the 19th September, 1792. Para 40.

⁵⁸ Quoted by B. D. Bose, *Rise of the Christian Power in India*, pp. 773-4.

It is superfluous to add any comment on the above extract. It clearly shows the mentality of the Britishers in the early days of the British rule in this country. We are not the least surprised over it. We quote it in order to dispel any illusion that still exists in certain quarters that the Permanent Settlement was adopted in the interest of this country. Judging all the relevant circumstances it is our considered opinion that the zemindary system in its present form is an unavoidable by-product of a system of land settlement which was brought into being under certain abnormal conditions and was designed not so much for furthering the good of our country as to meet the immediate needs and also the remoter necessities of the foreign rulers. It has been truly said that "the object of the Permanent Settlement was stabilisation of revenue demand in Bengal to enable Lord Cornwallis to establish order and security and prosecute his wars outside Bengal. Neither the injustice to the Bengal raiyat nor the welfare of the zemindars as *proprietors* loomed large in the picture at the time of the settlement".⁵⁹

2. *Provisions of the Permanent Settlement*

The main provisions of the Permanent Settlement can be summed up as follows:—

- (1) The zemindars were declared to be the proprietors of the soil and were "deliberately given all property which could not be proved to be an encroachment on the prescriptive or customary rights of the tenants". But these rights were not defined in the Regulations.
- (2) The Share of the zemindar on land was fixed as one-tenth of the State's share *plus* "the increment that might be derived from the extension of cultivation or other causes".

⁵⁹ Professor Radha Kamal Mukerjee's Reply to the Questionnaire issued by L. R. C. Report. See Report, Vol. VI, p. 565.

- (3) The State promised not to make any demand "for the augmentation of the public assessment in consequence of the improvement of their respective estates".
- (4) At the same time the zemindars were made liable to have their estates sold for arrears of revenue, if the revenue was not paid by sunset of the latest day fixed for each instalment; and no excuses, such as drought or famine, were to be accepted for non-payment.
- (5) Lastly, the State reserved the right to pass legislation at any time for the benefit and protection of the tenants.

The immediate history following the operation of the Permanent Settlement is too familiar to need any repetition here. That would unnecessarily increase the volume of our present work which it is not our intention to do. Neither would we sum up the various legislations passed since 1859 to ameliorate the conditions of the peasantry. We are not so much concerned with this or that right, nor with certain or other privileges granted to the peasants against the landlords as with the system of the Permanent Settlement itself. Various arguments have been put forward against it even from before its inception. A good number of them have, no doubt, been fortified by the results of its working for the last hundred and fifty years. These have been summed up by the Bengal Land Revenue Commission in their report published in 1940, which we may note here. Before, however, we proceed to discuss the findings and recommendations of the Bengal Land Revenue Commission we would see to the nature and extent of the tenures that are excluded from the scope and operations of the Permanent Settlement.

3. *Temporarily Settled and Other Lands*

Permanent Settlement was extended over major portions of Bengal, Bihar, Orissa and Chota Nagpur. The different

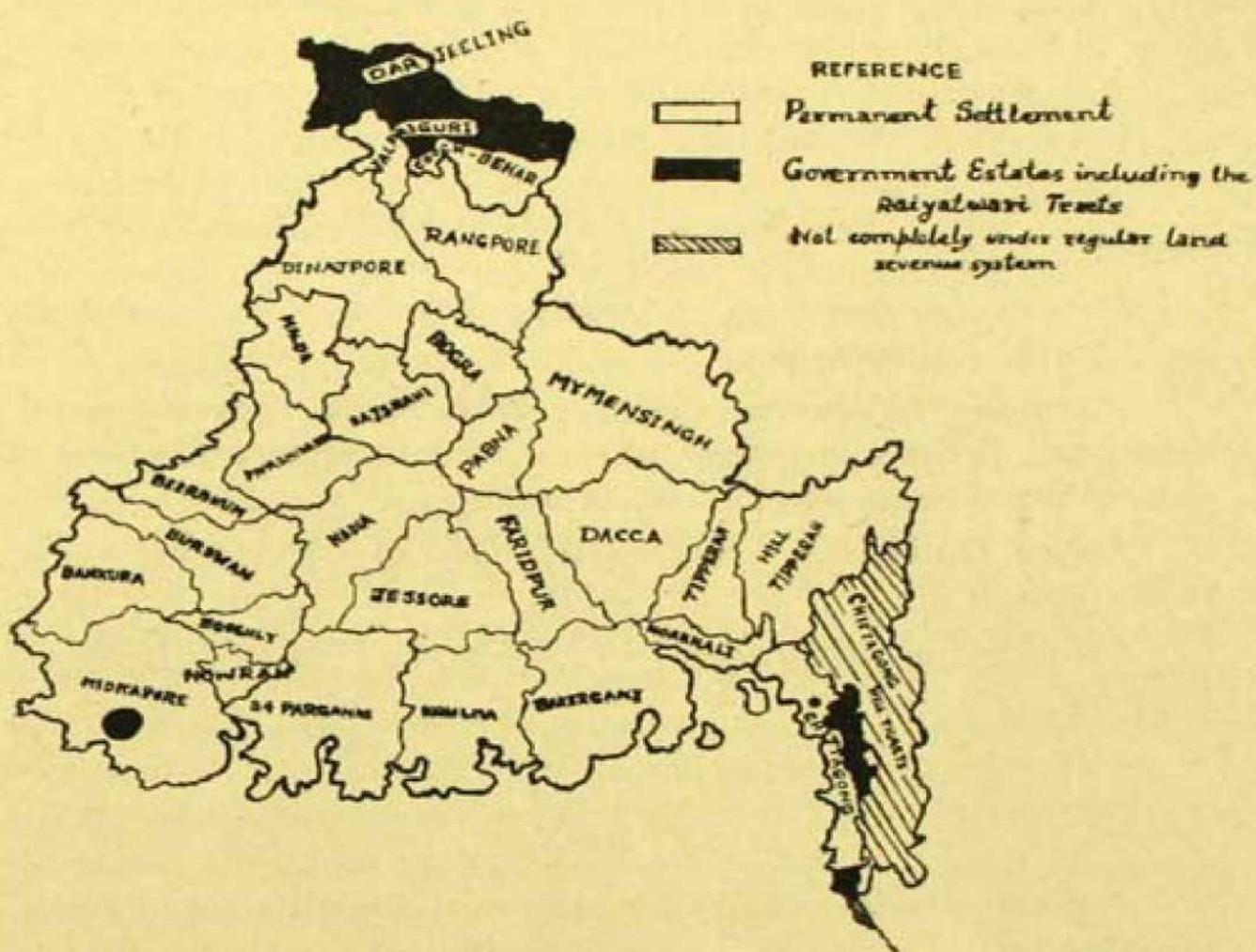


Diagram No. 14. Map of Bengal Showing the Different Systems of Land Tenure.



districts, as they are now constituted, where the Permanent Settlement was applied, are noted below :

(1) BENGAL

Burdwan Division: Bankura, Birbhum, Burdwan, Hooghly, Howrah, and Midnapore.

Presidency Division: Jessore, Khulna, Murshidabad, Nadia, and 24-Parganas.

Rajshahi Division: Bogra, Darjeeling (only a part), Dinajpur, Jalpaiguri (only part of the district lying south-west of the Teesta river), Malda, Rangpur, and Rajshahi.

Dacca Division: Bakarganj, Dacca, Faridpur, and Mymensingh.

Chittagong Division: Chittagong, Noakhali, and Tippera.

(2) BIHAR

Patna Division: Champaran, Darbhanga, Gaya, Muzaffarpur, Patna, Saran, and Shahabad.

Bhagalpur Division: Bhagalpur, Malda, Monghyr, Purnea, and Santhal Parganas (some parts only).

(3) ORISSA

Balasore, Cuttack, and Puri.

(4) CHOTA NAGPUR

Hazaribag, Lohardaga, Manbhum, and Singhbhum (only some parts of each district).

Some portions of Sylhet and Goalpara in Assam were also permanently settled.

But while the Permanent Settlement covered by far the larger parts of Bengal, Bihar and Orissa, there were also some temporarily settled lands, Government Estates and a few Raiyatwari Tracts. An idea of the comparative areas of land under these different systems of land-tenure can be formed from the following table showing the number of estates under and the total area of each.

TABLE NO. 103. No. of Estates under Different System of Tenure

	Permanent Settlement	Temporary Settlement	Government Estates	Raiyatwari Tracts	Total
Bengal	... 89,339	1,663	2,402	12	93,416
Bihar	... 68,306	501	564	16	69,387
Orissa	... 174	5,716	33	...	5,923
Chota Nagpur	... 149	4	308	4	4,465
Total	... 157,968	7,884	3,307	32	32,191

Of the 12 Raiyatwari estates in Bengal, Jalpaiguri and Darjeeling districts had 5 estates each.

As compared with the total number of different estates under the different non-permanent tenures existing in Bengal in the eighties of the last century, their present (1934-35) number stands as follows:—

TABLE NO. 104. No. of Estates and the Area under Different Systems, 1934-35

	Number of estates	Area in sq. mile
Permanently settled estates	... 93,965	58,669
Temporarily settled estates	... 4,235	4,969
Estates under direct management of the Government	... 3,600	5,193
Revenue-free areas	... ...	3,000
Total	... ... ...	71,831

The latest position as regards the distribution of land under different classes of estates is illustrated below:—

TABLE No. 105. Distribution of the Land Area under Different Systems of Tenure

Class of Tenure		In million acres	Percentage
I. Permanently settled areas (revenue-paying)	37.37	80.71	
II. Revenue-free estates	1.94	4.20	
III. Temporarily settled areas	3.34	7.21	
IV. Government estates	3.65	7.88	
Total	46.30	100.00	

Thus, it will be observed that even though Bengal is usually known as the permanently settled province, still she has some lands under Temporary Settlement, which form at present roughly one-twelfth of the lands settled permanently. The land held *khas* under the Government is also about one-twelfth of the land under permanent settlement. Thus, the combined proportion of lands temporarily settled and held *khas* form only about one-sixth of the land held under permanent settlement. The permanently settled estates comprise, in fact, more than 80 per cent. of the total assessed area.⁶¹ Hence it is no wonder that the land system of Bengal should generally mean lands governed by the Permanent Settlement Regulations.

Lands Under Temporary Settlement.—Now, under Temporary Settlement land is held by persons who are also recognised as proprietors, but the settlement is made for temporary periods and hence such lands are beyond the scope of the Permanent Settlement Regulations. The lands or estates under the Temporary Settlement are governed by the Regulation VII of 1822 and IX of 1833, and by certain special Acts. This class of estates includes:

(1) (a) Territory annexed by treaty or conquest after 1793:—Here the Government recognised the

⁶⁰ Cf. Baden Powell, *The Land System of British India*, Vol. I, pp. 470-71.

⁶¹ Cf. Gupta, *Land System of Bengal*, p. 5.

existing proprietary rights, but these were excluded from the scope of the Permanent Settlement.

- (b) Districts exempted from the operations of the Regulations.
- (2) Resumed and lapsed revenue-free lands lying outside the permanently-settled districts, but held by persons recognised as proprietors.
- (3) Alluvial accretions to temporarily settled estates.⁶²

Government 'Khas' Lands.—In the lands that are settled directly by the Government, there is actually no settlement of land-revenue. Government being the owner, the *revenue* is merged into *rent* taken by the Government as owner. As regards the management of these lands which are called the *Khasmahals*, two methods are generally adopted. First, the Government as landlords may deal directly with the tenants who are to pay their rents straight to the Government. This system is otherwise known as the *Raiyatwari* system. Secondly, a farmer or a middleman may be appointed on certain terms to collect the rents from the tenants and pay the same to the Government, keeping for himself a certain portion of his collection as his remuneration.

The *Khas* lands of Bengal include :

- (1) Waste lands which went absolutely unclaimed at the time of the Settlement. Such lands were found, in Bengal proper, mainly in Chittagong district and in the Sunderban areas. The ownership of these lands remained vested in the Government so long as they did not lease out or granted proprietary rights thereupon.
- (2) Lands or estates sold for arrears of revenue and purchased by the Government.
- (3) *Chars* or islands formed on the sea-shore or in the river beds, which were not accretions

⁶² Cf. Baden Powell, *op. cit.*, p. 444.

through alluvial deposits to existing non-Governmental estates.

- (4) Lands escheated to the Government.
- (5) Lands forfeited by the Government for some offence.
- (6) Lands acquired by conquest, which were not owned at the time of acquisition and on which no proprietary right was granted. Such lands are found in the Dooars of Jalpaiguri and in Darjeeling.
- (7) *Thanadari* lands, that is, lands formerly granted to zemindars for keeping up *thanas* or Police-Stations. The zemindars were subsequently relieved of this responsibility and the lands were resumed by the Government.⁶³

Now that we have seen the nature and extent of lands settled in Bengal otherwise than permanently, we may discuss the defects of those settled for good.

4. *Defects of the Present Land Revenue System of Bengal*⁶⁴

The defects of the existing land system of Bengal, as summed up by the Land Revenue Commission, are as follows:

1. *Financial Loss*—

- (i) It has stereotyped the land revenue which is far below the share which the State in all fairness should have received from the land.
- (ii) The land revenue in Bengal is substantially less than that of other provinces where there is no Permanent Settlement and where the land is less productive.

⁶³ *Ibid.*, pp. 445-6.
⁶⁴ *J. R. C. Report*, Paras 80-8.

- (iii) The Government have been deprived of any share in the increment in the value of land due to the increase in population and the extension of cultivation.
- (iv) It has perpetuated an assessment having no relation to the productive quality of the land, and varies widely in its incidence, and becomes more and more uneven as time goes on.
- (v) It has entailed upon the Government the loss of revenue from minerals and from fisheries in certain navigable rivers which have been exploited for private gain.
- (vi) The revenue payable by the Zemindars being permanently fixed, while at the same time the Zemindars being exempted from the payment of income tax on agricultural incomes,⁶⁵ an undue burden has been thrown on other classes of tax-payers.
- (vii) The discrimination in favour of land has led to a bias in favour of investments in land rather than in industrial enterprise.

2. *Absence of Contact with the Cultivators.*—Until very recently the Government had very little contact with and intimate knowledge of rural conditions due to

- (i) a comparatively low cost of collecting the revenue;
- (ii) the punctuality of payment; and
- (iii) the interposition of a vast intermediary class.

Moreover, Bengal lacks an up-to-date record-of-rights such as obtains in *raiyatwari* areas.

3. *Absence of Agricultural Improvement.*—One of the avowed intentions of Lord Cornwallis behind the Permanent Settlement was that it would result in the creation of a class of landlords who would supply capital for the improvement of the land and for the extension of cultivation. But his hopes have not been realised. The extension of cultivation

⁶⁵ An agricultural income-tax has since been imposed in Bengal.



since the Permanent Settlement has, with few exceptions, been the work of the actual cultivators rather than that of the Zemindars as a class. The Commission, in this connection, have endorsed the view of the Government of India regarding the defects published in their Memorandum on the Land Revenue Policy in 1902, which are as follows:

- (i) evils of absenteeism;
- (ii) evils of management of estates by unsympathetic agents;
- (iii) evils of unhappy relations between landlord and tenants; and
- (iv) evils of multiplications of tenure-holders or middlemen between the Zemindar and the cultivator.

The Commission quote the following passage from the Memorandum as an authoritative exposition of one of the principal defects of the existing Settlement. The Permanent Settlement is a system of agrarian tenure "which is not supported by the experience of any civilised country, which is not justified by the single great experiment that has been made in India, and which was found in the latter case to place the tenants so unreservedly at the mercy of the landlord that the State had been compelled to employ for his protection a more stringent measure of legislation than has been found necessary in temporarily settled areas".

4. *Evils of Sub-infeudation.*—The Commission are of opinion that "one of the most serious defects of the present system is the excessive amount of sub-infeudation which it has encouraged". The creation of a big number of intermediate interests between the zemindars and the actual cultivators has been made possible because there is a large margin between the fixed land revenue and the economic rent. This has been a great handicap to the improvement of land, as responsibility is widely shared. What is every body's business is no body's business. The Government of the Province have done far less to develop increased produc-

tion from land than what have been done by the Governments of other provinces, because the former have very little inducement for it when the benefit of an improvement goes to private hands.

Furthermore, the number of rent-receivers is increasing every year. There was an increase in their number by 62% between 1921 and 1931, while the number of actual cultivators possessing occupancy rights decreased, that is, the number of landless labourers increased, in the same period by 49%.

Side by side with the evils of sub-infeudation, the Commission also mention those of the fragmentation of proprietary interests in land although its causes are not directly related to the Permanent Settlement.

5. *Administrative Defects.*—The much complicated land system of the Province leads to an "immense volume of litigation". Suits relating to interests in land occupy much of the time and attention of the Civil Courts. The cost to the litigants is far in excess of the revenue and is out of all proportion to the amounts at stake.

Moreover, the unsatisfactory system of record-keeping in the zemindar's offices confuses the respective rights and obligations of the parties and has led to the exploitation of the illiterate peasantry.

Another, serious disadvantage from the administrative point of view is that it is virtually impossible to grant remission of rent in permanently settled areas affected by drought, flood or other natural calamities, because it would never pay a zemindar to take a remission of Rs. 100/- in revenue if at the same time he had to allow Rs. 1,000/- in remission of rent.

6. *Increasing Loss of Occupancy Rights.*—The Commission admit that the general level of rents paid by the statutory raiyats is low; but owing to subletting and the free right of transfer the hereditary raiyats are losing their status and the actual cultivators are becoming mostly men



who are either paying a cash rent which corresponds to a full economic rent, or are cultivating under the *barga* system and paying as rent one-half of the produce. The Commission have, in this connection, made the following important remark: "Rents in Bengal have not been fixed on any scientific principle and have no recognised relation to the quality of the land or the value of the produce from it".

7. *Accumulation of Arrear Rents.*—The absence of a satisfactory procedure for the recovery of rent and also the customary, expensive and dilatory process of the Civil Courts have caused rents to fall into arrear for several years before suits are instituted. In the opinion of the Commission, "this is a highly undesirable feature of the present system which it may not be possible to alter radically, so long as the Permanent Settlement and the Zemindary system remain in operation". The Commission, further, hold that if these systems remain unaltered and the strict observance of the Sale Law with a more sparing resort to the protection of the Court of Wards is maintained, there is every possibility of the whole system being broken down completely.

In the course of expressing their concluding opinion on the present position the Commission have observed: : "The present system, while containing some of the features of both the landlord and the tenant, and the peasant proprietorship systems, possesses most of the disadvantages and few of the advantages of either system. Under it the actual cultivator has too the worst of both worlds".

Conclusion.—In the preceding paragraphs we have put in a classified form the defects of the present land revenue system of the Province, as summed up by the Bengal Land Revenue Commission. Almost all the outstanding defects are pointed out and it is unnecessary to add any comment upon them. It may, however, be pointed out that one of the serious defects of the Permanent Settlement was the undue haste with which land revenue was fixed at the time of the Settlement without taking into consideration all the

relevant data. The stability and security of revenue were the only considerations that weighed heavily in the minds of its promoters, particularly of Cornwallis. Such stability and security were secured no doubt, but at an immense cost. While the revenue fixed was originally unduly high, leading to a complete upset of the then existing ownership, in the course of its long continuance it has become far less than what it actually should have been and has, thus, deprived the whole community of a share in the improved land values due to social progress. It has been estimated that even as early as 1900 the gross rental was Rs. 16·5 crores whereas at the time of the introduction of the Permanent Settlement it was approximately Rs. 4·5 crores. None the less, the share of the Government has been fixed for all this time.⁶⁶ That means, as pointed out by Professor Mukerjee, the share of the State has decreased from 90% to 20% of the gross rental at the present time, because, firstly, the aggregate rent has greatly increased while the revenue has remained unaltered, and, secondly, the purchasing power of rupee has gone down considerably since 1793. The present annual loss to the Government resulting from the fixity of revenue has been estimated by Dr. Panandikar to be Rs. 600 laks.⁶⁷

Secondly, the most outrageous defect of the Permanent Settlement has been, to put in the words of Baden-Powell, "that of assuming to a legislature the power of binding all future law-givers, and permanently exempting a certain class of proprietors from their due share of the State burdens at the expense of other people . . . ".⁶⁸

Thirdly, the settlement was defective in that the Zemindar's right was not limited "with regard to all the older raiyats, leaving new-comers to be in principle (with such detailed conditions as might be advisable) contract-

⁶⁶ Mukerjee, *op. cit.*, p. 309.

⁶⁷ Panandikar, *Wealth and Welfare of the Bengal Delta*, p. 124. According to the Land Revenue Commission, the annual loss in this generation from the effects of Permanent Settlement may be estimated at anything between Rupees 2 crores and 8 crores. Para 73 of the Report, Vol. I.

⁶⁸ Baden-Powell, *op. cit.*, p. 403.



tenants".⁶⁹ The tenants have tasted with their life-blood the bitterest pill of such absolute and undefined power with which the zemindars were armed by the Settlement Regulations.

Lastly, as we have already said, the Regulations made the fundamental error of assuming that State was the owner of the land, and of transferring this supposed proprietary right to the zemindars. As Mukerjee has observed, "In Bengal the mistake of the Permanent Settlement was that the zemindars, who were only land-holders, were identified with the English landlords, real proprietors, and the rights of the tenants were so 'completely effaced that at present it is difficult to find a single vestige or ascertain what they were'.⁷⁰ This mistake subsequently was repeated in more than one province. The Government first created the middlemen, called them landlords, and wresting some of the immemorial customary rights of cultivators, gave these to the landlords as guarantee of punctual payment of the *Kist* of the Sarkar".⁷¹

5. *Remedies Suggested by the Commission Minority View*⁷²

While majority of the Commission are of opinion that the Permanent Settlement have led to the above-stated financial, administrative, social and economic defects and, hence, they have suggested that State acquisition is the only satisfactory solution, in the opinion of a minority State acquisition of land would be not only financially a hazardous experiment, but also undesirable for social and economic reasons. According to them, the present economic difficulties of the cultivators of our Province are independent of any

⁶⁹ "The net effect of the law and practice of the Permanent Settlement and the measures connected with it was not only to depress the condition of the peasants, but to place them almost entirely at the mercy of the zemindars." Banerjee, *History of Indian Taxation*, p.

⁷⁰ Quoted from Field.

⁷¹ Mukerjee, *op. cit.*, p. 49.

⁷² L. R. C. Report, Vol. I, Paras 89-93.

defects of the land system. The real causes of these defects, in their opinion, are:

- (i) the increasing pressure of population on land;
- (ii) the Hindu and the Moslem Laws of inheritance which have resulted in the subdivision and fragmentation of holdings;
- (iii) the absence of any occupation for the cultivators during a great part of the year; and
- (iv) the fall in agricultural prices since 1929.

These defects have to be remedied irrespective of whether the present land system is retained or supplanted by a system of State-ownership. Further, they contend that inspite of the alleged defects of the present land system the occupancy raiyat in Bengal pays on the average a lower rate of rent than in any other Province and enjoys greater protection of law than the tenants of other provinces.

Hence, the minority are of opinion that State acquisition *per se* will not benefit the cultivators. Merely the replacement of the present landlords and the substitution of the Government in their place will not improve the lot of the cultivators until and unless

- (i) lands are redistributed to provide economic holdings;
- (ii) difficulties of consolidating scattered plots are overcome;
- (iii) the laws of inheritance are changed;
- (iv) transfers to non-agriculturists are prevented; and
- (v) rents are not liable to increment.

Above all, there will be a revolutionary change in the social structure of Bengal. Admitting the present defects of sub-infeudation they point out that its one redeeming feature has been that "it has led to a wide distribution of wealth and has given an interest in land to many of the middle classes". According to the *Census Report of 1931*, the total number of persons dependent or mainly dependent upon rents in the Province is about 2·25 millions. Many

of them have invested money in land and it is but just that they should have some return from their investment. Hence, the Minority contend, the acquisition of all landed interests above the actual cultivators will sever the connection of a large section of people from their source of livelihood.

Fourthly, a scheme of State acquisition will lead to the wastage of a great part of capital now invested in land. The number of big landlords and tenure-holders is small, and the small estates and tenures constitute by far the greater proportion of holdings. The compensation which the latter will receive, it is argued, for the loss of their rights will not be sufficient to induce them to invest their money in industries. They will either squander the money away, in which case there will be a wastage of the capital assets of the Province, or they will re-invest the sum in land by purchasing occupancy holdings, in which case a new form of landlordism will reappear, though on a lower scale.

An apprehension is also expressed by some members as to the possibility of rent being reduced even below the required limit if the Government become the sole landlord, because legislatures will be ultimately controlled by the tenants who will not tax themselves sufficiently. Moreover, the demand for rent reduction will be intensified.

Majority View⁷²

The objections to the State acquisition have been considered by the Commission as a whole. But the majority members, inspite of these objections, are "definitely of opinion that no other solution than State acquisition will be adequate to remedy the defects of the present land system". The majority of the Commission are convinced that "in order to improve the economic condition of the cultivators the Permanent Settlement and the Zemindary system should be replaced by a Raiyatwari system under which the Government will be brought into direct relations with the actual

⁷² *Ibid.*, Paras 94-6.

cultivators by the acquisition of all the superior interests in agricultural land".

The advantages of State acquisition are enumerated as follows:—

- (i) The Government as sole landlord would be in direct relation with the actual cultivators and, thus, would be in a stronger position than any private landlord to initiate schemes for
 - (a) the consolidation of holdings,
 - (b) the restoration of economic holdings,
 - (c) the provision of grazing land, and
 - (d) the prevention of transfers of lands to non-agriculturists.
- (ii) Government management, even if not universally popular, will certainly be more efficient and more in the interest of the agriculturist than zemindary management.
- (iii) Granting that rents would increase under Government management, the increments would not be appropriated by private individuals but would be returned to the people in the form of improved social services.
- (iv) Government management will lead to a far more satisfactory arrangement for revising rents throughout the Province, or for maintaining the record-of-rights, than is possible under the zemindary system.
- (v) There will be better arrangements for arrears of rents.

Conclusion.—In view of the above considerations the Majority of the Commission conclude that

- (i) whatever might have been the justification for the the Permanent Settlement in 1793, it is no longer suited to the conditions of the present time;

- (ii) the zemindary system has developed so many defects that it has ceased to serve any national interest;
- (iii) no half measures will satisfactorily remedy its defects;
- (iv) the land revenue policy should aim at bringing the actual cultivators into the position of tenants holding directly under the Government, provided a practicable scheme can be devised to acquire the interests of all classes of rent-receivers on reasonable terms; and
- (v) the scheme can only be carried out gradually over a term of years, as it involves a fundamental change in the rural economy of Bengal affecting vitally the entire social and economic fabric of the Province.

To quote the precise language of the Commission: "The majority of the Commission hold the view that in the interests of the Province as a whole, the present land tenure system cannot remain unaltered. In fact, if present conditions continue, it may not be too much to say that the system will break down of its own accord. It is unsuited to modern conditions, and has brought about a situation in the Province, in which the welfare of the Province is neglected, and a great proportion of the wealth from the land is appropriated by middlemen, most of whom have no connection with agriculture and have treated the land simply as a commercial investment. The choice lies between introducing a raiyatwari system, by buying all the interests in land above the cultivator, and attempting to prolong the life of a system which has already outlived its usefulness. The majority of members feel that the defects in present system can only be remedied if the State comes into direct relation with the actual cultivators, and would strongly emphasise their view that this should be aim of Government".

INDEX

(Numbers refer to pages)

A

- Adams-Williams, 44
 Afghanistan, 32, 33
 Agricultural Economics, 2-3
 Agricultural Departments, 68
Agricultural Statistics of Bengal, 76
Aitareya Aranyaka, 36
Aitareya Brahmana, 36
 Ajay, R., 23, 24, 64
 Akbar, 200
 Algonkian, 72
 Alluvium, 57
 Alps, 31
 America, North, 32
 South, 32
 Anga, 36
 Angira, 191
 Angshumāna, 36, 37
 Antarctic Continent, 32, 33
 Apastamba, 191, 193
 Arabia, 31
 Arakan Yoma, 34
 Archaen Age 30, 72
 Area—
 Classification of the Land, 73-5
 Distribution of the Gross Cultivated, 84-5
 Double Cropped, 80-7
 Irrigated, 81, 84
 Net Cultivated, 146
 Argentine, 146
Arthasastra, 194
 Aryans, 35, 36, 38, 188, 189
 Aryavarta, 35
 Asia, 32
 Asia Minor, 31, 33
 Assam, 12, 35, 44, 57, 59, 91, 109,
 113, 117, 155, 166, 214
 Valley, 47
 Hills, 30
 Gulf, 34
 Atreyi R., 17
 Atri, 191
 Atlantic, 32
 Australia, 133, 169, 173, 174
 Austria, 130, 139, 146, 174
 Aykroyd, 154
 Aymas, 199

B

- Baden, 138
 Baden Powell, 187
 Bahawalpur, 39
 Bakarganj, 14, 74, 75, 77, 78, 79, 81,
 83, 84, 85, 89, 92, 93, 95, 96, 97,
 98, 103, 105, 111, 114
 Bakreswar R., 23
 Baksa-Duar, 12, 13, 14, 50, 101
 Baluchistan, 33
 Bankura, 10, 14, 15, 60, 64, 74, 75,
 77, 78, 79, 81, 83, 84, 85, 89, 92,
 93, 95, 99, 105, 107, 111, 114
Barendrabhumi, 62
 Basutoland, 187
 Baudhayana, 193
 Bavaria, 130, 138
 Bay of Bengal, 8, 35, 41
 Current, 11, 12, 45
 Belgium, 130, 139, 146, 174
 Bengal, 3, 11, 12, 13, 29, 35, 36, 44,
 45, 57, 73, 86, 88, 91, 108, 109,
 113, 117, 121, 124, 125, 126, 127,
 129, 131, 141, 146, 151, 166, 169,
 174, 180, 214
 Area, 7
 Boundary and Topography, 8
 Central, 13, 19, 20, 21, 23, 30, 44,
 47, 101, 102, 103
 Classification of Land Area of, 73-5
 East, 16, 47
 North, 13, 16, 17, 18, 47, 101, 104
 Rainfall in, 10-15
 Regional Classification of, 15-6
 River systems, 16-48
 Soil, 48-72
 South, 13, 44
 Temperature, 9-10
 West, 13, 16, 23, 34, 31, 64, 65,
 101, 102, 103, 104, 107
 Bengal Presidency, 7
 Berar, 57
 Bering land, 32
 Betna R., 19, 22
 Bhagiratha, 30, 36, 37, 38, 42, 44
 Bhagirathi R., 19, 20, 21, 22, 29,
 30, 42, 44, 62

Bhairab R., 19, 21
 Bhairabazar, 28
 Bias, 39
 Bihar, 8, 29, 214
 Bihar and Orissa, 7, 87, 91, 109, 113, 141, 155, 166, 174
 Bikanir, 39
 Birbhum, 10, 14, 15, 36, 60, 63, 64, 74, 75, 77, 78, 79, 81, 83, 85, 89, 92, 93, 99, 105, 107, 111, 114
 Birth-rate, 135-44
 Boalia Rampur, 19
 Bogra, 14, 74, 75, 77, 78, 79, 81, 83, 85, 89, 92, 93, 95, 97, 99, 104, 105, 107, 111, 114
 Bombay, 7, 57, 86, 91, 109, 124, 141, 146, 155, 166, 174
 Borneo, 33
 Boundary, 5, 8-9
 Brahmaputra R., 16, 17, 25, 28, 29, 30, 35, 38, 40, 41, 45, 46, 47, 57, 60, 62, 63, 104
 Brahmavarta, 36
 Burdwan, 10, 14, 20, 21, 26, 36, 60, 63, 64, 74, 75, 77, 78, 79, 81, 83, 85, 89, 92, 93, 97, 99, 103, 105, 107, 111, 114
 Burma, 12, 30, 33, 59
 Gulf, 34

C

Calcutta, 20, 21, 26, 105, 115
 Cambay, Gulf of, 39
 Cambrian Period, 72
 Canada, 118, 146, 169, 174, 178
 Carboniferous Period, 72
 Carr Saunders, 137
 Cenozoic Period, 31, 33
 Central Asia, 10, 11, 32
 Central Provinces and Berar, 7, 57, 58, 87, 88, 91, 109, 113, 117, 146, 155, 166
 Ceylon, 11, 145
 Cherrapunji, 12, 28
 Chile, 145
 China, 31, 32, 184
 Chinab R., 39
 Chitra R., 19, 22
 Chittagong, 13, 14, 28, 63, 64, 69, 74, 75, 77, 78, 79, 81, 83, 84, 85, 89, 92, 93, 96, 97, 98, 100, 105, 107, 111, 114, 124
 Hill Tracts, 14, 15, 74, 75, 77, 78, 79, 81, 83, 84, 85, 89, 92, 93, 95, 98, 99, 101, 114
 Chota Nagpur, 8, 15, 23, 24, 27, 58, 64, 214

City, 115
 Clarke, 54
 College, University Science, 48
 Commission—
 Bengal Land Revenue, 76, 79, 212, 220
 Royal-on Agriculture, 82, 153, 159, 160
 Indian Statutory, 163
 Committee—
 Bengal Paddy and Rice Enquiry, 82
 Central Banking Enquiry, 110
 Cooch-Behar, 73, 91, 203
 Cornwallis, 209, 210, 219, 223
 Cossye R., 23, 24, 27, 64
 Cretaceous Period, 33
 Cromer Earl, 133
 Culturable Waste, 74, 76
 Cutch, 34
 Czechoslovakia, 145, 175

D

Dacca, 14, 28, 60, 74, 75, 77, 78, 79, 81, 83, 85, 89, 92, 93, 94, 95, 97, 99, 103, 105, 107, 111, 114
 Dacca Farm, 69
 Damodar R., 19, 20, 21, 23, 34, 25, 26, 27, 30, 62, 63, 64
 Kana, 20
 Technical Committee on, 27
 Advisory Committee on, 27
 Darjeeling, 8, 13, 14, 15, 65, 66, 74, 75, 77, 78, 79, 81, 83, 84, 85, 89, 92, 93, 95, 98, 101, 105, 107, 111, 114
 Dasaratha, 37
Dayabhaga, 194
 Death Rate, 126-35
 and National Dividend, 132-35
 Deccan Plateau, 30, 31, 32, 34, 54, 57
 Deccan Trap, 33, 52
 Delta, Old, 16
 New, 16
 Denmark, 130, 138, 139, 144, 146, 172, 177, 178
 Density, 90-8
 and Rainfall, 98
 Factors determining the—of population, 101-04
 Fertility and, 105-6
 Irrigation and, 106-8
 Desert, Siberian, 31
 Gobi, 31
 Indian, 31
 Devonian Period, 72

INDEX

Dewani, 202, 209

Dhalkishore R., 23

Digha, 8

Dihang R., 46

Dilip, 37

Division—

Burdwan, 13, 19, 84, 88, 98, 99,
100, 101, 105, 107, 108, 166, 168

Chittagong, 13, 28, 84, 88, 97, 99,
100, 105, 108, 124, 166, 169

Dacca, 84, 88, 97, 99, 105, 108, 166,
169

Presidency, 13, 84, 88, 98, 99, 101,
105, 107, 108, 124, 166, 168

Rajshahi, 13, 17, 84, 88, 99, 101,
105, 107, 108, 124, 166, 169

Dinajpur, 14, 74, 75, 77, 78, 79, 81,
83, 84, 85, 89, 92, 93, 95, 99

Doubleday, Thomas, 135, 137

Drisadvati R., 36

Dutt, R. C., 208

E

East India Company, 202, 208

Eastern Ghats, 59

Eastern Gulf, 34

Eden Canal, 25

Egypt, 145, 174

England, 128, 129, 130, 137, 139, 144,
172, 173, 177, 178, 180, 183

England and Wales, 91, 93, 108, 109,
118, 130, 136, 141, 146, 182

Eocene, 72

Eogene, 72

Eogene Section, 33

Equator, 9, 11

Europe, 32, 91

Everest, 45

F

Fallows, Current, 73, 74

Faridpur, 14, 74, 75, 77, 78, 79, 81,
83, 84, 85, 89, 92, 93, 95, 96, 97,
99, 103, 105, 107, 111, 114

Farms, Government, 69

Fergusson, 18, 44

Fiji, 178

Finland, 130, 138

Forests, 73

France, 7, 87, 91, 118, 119, 122, 130,
133, 134, 136, 139, 144, 146, 169,
172, 173, 174, 177, 178

Francis, Sir Phillip, 209

Fyzabad, 36

G

Ganges R., 17, 18, 19, 20, 22, 23, 24,
28, 30, 35, 36, 37, 38, 39, 40, 41,
42, 43, 44, 45, 50, 57, 60, 62, 63,
104

Valley, 12, 16, 42

-Brahmaputra Doab, 16, 18, 63

Silt, 69

Garai R., 19, 21, 23

Gautama, 169

Geological Era, 31

Germany, 7, 82, 91, 118, 119, 122,
123, 130, 131, 133, 134, 136, 138,
139, 144, 146, 172, 173, 174, 177

Glacial, 72

Goalanda, 17, 29

Godavari R., 57

Gomoh, 25

Gondwana System, 33

Grand Trunk Road, 25

Great Britain, 7, 87, 91, 121, 125,
126, 134, 169, 180, 172

Greece, 195

Greenland, 32

Gumti R., 28

H

Hakra R., 39

Halda R., 28

Haldi R., 24, 54

Hamburg, 130, 136

Hardwar, 29

Harita, 191

Himalayas, 12, 29, 30, 31, 33, 34,
35, 36, 63

Himalayan ranges, 8, 11, 12, 45, 50

Himalayan region, 9, 15, 32

Sub-, 15

Sea, 33

Holderness, Thomas, 110

Holland, 130, 144, 172, 174, 177, 178

Hcoghly, 14, 24, 74, 75, 77, 78, 79,
81, 83, 85, 89, 92, 93, 95, 97, 99,

103, 105, 107, 111, 114

Hooghly R., 19, 20, 21, 64

Hoorsagar R., 17

Howrah, 14, 24, 74, 77, 78, 79, 81,
83, 95, 89, 92, 93, 94, 95, 97, 99,

105, 107, 111, 114

Humus, 54

Hungary, 136, 145

Hutton, 122, 148

Hyderabad, 59

Hydro-Dynamic Research Station,
48

I

- Iceland, 32
 Illiteracy, 165-71
 India, 10, 127, 129, 130, 133, 134, 144, 169, 172, 173, 178, 182, 187
 Northern, 11
 Peninsular, 32
 South, 57, 59
 Soils of, 67-8
Indian Land System, 198
 Indian Ocean, 8, 10, 32
 Indo-Brahm R., 35, 41
 Indo-Gangetic Alluvial Plain, 57
 Indus R., 35, 38, 39, 40, 41, 57
 Infant mortality, 144-49
 Introduction, 1-6
 Ireland, 130, 139, 146, 174
 Italy, 7, 87, 91, 122, 130, 136, 139, 144, 146, 169, 172, 174, 177, 178

J

- Jaigirs*, 199
 Jaimini, 185, 193
 Jaimini-Sutra, 194
 Jalangi R., 21, 22
 Jaldhaka R., 17
 Jalpaiguri, 12, 13, 14, 15, 64, 74, 75, 77, 78, 79, 81, 83, 85, 89, 92, 93, 95, 98, 101, 105, 107, 111, 114
 Jamuna R., 17, 18, 29, 20, 22, 28
 Japan, 7, 87, 91, 102, 122, 133, 136, 145, 169, 172, 173, 177, 178, 187
 Java, 33, 187
 Jessore, 14, 19, 20, 46, 74, 75, 77, 78, 79, 81, 83, 85, 89, 92, 93, 95, 99, 103, 105, 107, 111, 114
 Jihlam R., 39
 Jimutvahana, 194
 Jones, Sir William, 197
 Joshi, 133
 Jumna R., 41
 Jungle, Madhupur, 60

K

- Kapila, 36
 Karatoya R., 17, 104
 Karnafuli R., 28
 Katwa, 20
 Katyayana, 191
 Kautilya, 194, 195, 196
 Keleghai R., 27
 Kharif, 62
 Khasi Hills, 12
 Khas Lands, 217-18
 Khiraj, 199, 220

- Khulna, 14, 74, 75, 77, 78, 79, 81, 83, 85, 89, 92, 93, 95, 97, 99, 105, 107, 111, 114
 Kistna R., 57
 Kobadak R., 19, 22
 Kodla R., 19
 Konai-Jhinai, 46
 Koshi R., 18
 Kurukshetra, 36, 37

L

- Laboratory, River Research, 48
 Land
 Utilisation of the, 73-85
 Classification of the—area, 73-5
 Cultivable waste, 76-8
 Utilised and utilisable, 78-80
 Double-cropped area, 80-7
 Area irrigated, 81-4
 System, 185-228
 Hindu—, 185-98
 Mohomedan—, 199-102
 British—, 202-04
 Land Revenue System of Bengal,
 Defects, 218-24
 Remedies suggested by the Land
 Revenue Commission, 224-28
 Laterite, 58
 Limestone, 53
 Loam Clayey, 62
 Low Expectation of Life, 171-80
 Consequences of, 174-80
 Lushai Hills, 15

M

- Madhavacharya, 194
 Madhumati R., 23
 Madhyadesa, 36
 Madras, 7, 87, 91, 107, 109, 113, 141, 146, 155, 166, 174
 Red soil of, 58
 Maereker, 55
 on classification of surface soil, 56
 Magadha, 36
 Mahabharata, 36, 41, 42
 Mahanadi R., 57
 Mahananda R., 17, 18
 Majumdar, S. C., 18, 19, 30, 36
 Majumdar, R. C., 37 f.n.
 Malda, 14, 29, 60, 74, 75, 77, 78, 79, 81, 83, 85, 89, 92, 93, 99, 105, 107, 111, 114
 Manikpal Farm, 69
 Manu, 35, 36, 190, 191, 193, 195, 196, 197

INDEX

233

Marshall, 1
 Maternal mortality, 149-52
 Mathabhanga R., 21, 22, 30
 Mayurakshi R., 69
 Mediterranean Sea, 32
 Meek, Sir David, 156
 Megaw, Sir John, 153
 Meghna R., 19, 25, 28, 30, 45, 62, 63
 Mesozoic Era, 32, 33
 Mexico, 145
 Gulf of, 45
 Midnapore, 8, 10, 14, 15, 24, 27, 60,
 63, 64, 69, 74, 75, 77, 78, 79, 81,
 83, 85, 89, 92, 93, 95, 97, 99, 105,
 107, 111, 114
 Mill, James, 197
Mimamisa-Sutra, 194
 Miocene, 72
 Mississippi R., 45, 48, 50
 Mitra, J., 186, 190, 191, 199, 200, 202
 Monsoon, north-east, 11, 12
 south-west, 11, 12
 Mookerjee, Radha Kumud, 186, 189,
 197, 198, 209
 More R., 64
 Mukerjee, Radha Kamal, 22, 35, 154,
 156, 187, 188, 192, 198
 Munshiganj, 28, 30
 Murshidabad, 14, 19, 29, 36, 63, 74,
 75, 77, 78, 79, 81, 83, 85, 89, 92,
 93, 99, 103, 105, 107, 111, 114
 Mymensingh, 14, 17, 30, 45, 46, 60,
 74, 75, 77, 78, 79, 81, 83, 85, 89,
 92, 93, 95, 96, 99, 103, 105, 107,
 111, 114

N

Nabaganga R., 19, 22
 Nadia, 14, 29, 36, 74, 75, 77, 78, 79,
 81, 83, 85, 89, 92, 93, 95, 99, 103,
 105, 107, 111, 114
 —Rivers, 22, 23
 Naorojji, Dadabhai, 133
 Narada, 191, 196
 Neogene Section, 33, 34, 35, 38, 72
 Nepal, 34
 Netherlands, 138
 New York, 7, 87, 91
 New Zealand, 174
 Nile, 38
 Nilgiris, 59
 Nitrogen, 55, 56, 57, 58
 Noakhali, 13, 14, 63, 74, 75, 77, 78,
 79, 81, 83, 85, 89, 92, 93, 94, 95,
 97, 99, 100, 103, 105, 107, 111,
 114
 North-East Trade Winds, 10
 North Temperate Zone, 9

Northern Continent, 32
 Northern Ireland, 118, 146, 174
 Norway, 130, 139, 144, 146
 Notions of Proprietary Rights, 185-
 93
 Nourishment, problem of, 153-59
 N. W. F. Province, 113, 166

O

Oligocene, 72
Oosher, 199
 Orissa, 64, 166, 214

P

Pabna, 14, 29, 74, 75, 77, 78, 79, 81,
 83, 84, 85, 89, 92, 93, 95, 97, 99,
 105, 107, 111, 114
 Padma R., 19, 20, 25, 28, 30, 62, 63
 Paleocene, 72
 Paleozoic Era, 32, 72
 Pamir Knot, 31
 Panandikar, 223
 Parasara, 191, 193, 195
 Parganas-24, 19, 23, 74, 75, 77, 78,
 79, 81, 83, 85, 89, 92, 93, 95, 97,
 99, 105, 107, 111, 114
 Santhal, 15, 23, 27, 64
 Pascoe, 35
 Peninsular India, 32, 33
 Permian Period, 32, 72
 Phillips, Sir Arthur, 190
 Phosphoric Acid, 55, 56, 57, 58
 Physical Characteristics, 4, 7-74
 Pilgrim, 35
 Pleistocene, Middle, 35, 72
 Pliocene, 72
 Poland, 145
 Population, 5, 86-184
 General Survey, 86-119
 Total, 86
 Rate of Increase, 87-8
 In the Districts, 89
 Density, 90
 Effective pressure on land, 109-12
 Urban and Rural, 112-17
 Distribution of Rural and Urban
 —in other countries, 117-19
 Occupational Distribution of, 119-
 26
 Total working, 119
 Problems of, 126-80
 Problem of Over-population, 180-
 84
 Malthusian Law of, 181

Portugal, 136, 145
 Potash, 55, 56, 57, 58
 Prayag, 30
 Pre-Cambrian Time, 30, 31, 72
 Prithviraj, 200
 Prussia, 130
 Public Health, 159-65
 Service, 164
 Punjab, 7, 11, 34, 35, 36, 39, 57, 87,
 88, 91, 107, 109, 113, 146, 155,
 166, 174
 Purnabhaba R., 17
 Purva-Mimamsa, 193

Q

Quaternary Period, 72

R

Rabi crops, 62
 Rainfall, 10-15
 Distribution, 13
 Importance, 13
 and Density, 98-101
 Rainwash, 49
 Raiyatwari estates, 215
 Systems, 217
 Rajmahal, 44
 Rajputana, 34, 35
 Rajshahi, 14, 29, 60, 74, 75, 77, 78,
 79, 81, 83, 84, 85, 89, 92, 93, 95,
 97, 99, 104, 105, 107, 111, 114
 Rama, 36, 37
 Ramayana, 37, 38
 Rangpur, 14, 74, 75, 77, 78, 79, 81,
 83, 84, 85, 89, 92, 93, 95, 97, 99,
 104, 105, 111, 114
 Rasulpur R., 24
 Rate of Survival, 141-44
 Ravi R., 39
 Region, Himalayan, 15
 Sub-Himalayan, 15
 Eastern Hills, 15
 Deltaic, 15, 16
 Regulation II of 1793, 203
 Regur, 57
 Report, of the Royal Commission
 on Agriculture, 4
 of the Land Revenue Commission,
 Bengal, 4, 80, 186
 Bengal Season and Crop, 73, 81
 Census—of Bengal, 1931, 79, 81-2,
 90
 Rhys Davids, 192
 Rights of the State, 193-98

River Systems of Bengal, 5, 16-48
 Northern System, 17
 Central System, 19
 Western System, 23
 Eastern System, 28
 Fifth System, 28
 Rocks, 52
 Crystalline, 54
 Igneous, 52
 Metamorphic, 53
 Organic, 53
 Sedimentary, 52, 54
 Stratified, 52
 Rock-forming elements, 54
 Rumania, 145, 146
 Rupnarain R., 21, 24
 Russel, Sir John, 155
 Russia, 174

S

Sagara, 36, 37, 42
 Saha, M. N., 48
 Saktigarh, 25
 Salt Range, 33
 Saraswati R., 19, 22, 36, 41, 42
Satapatha Brahmana, 191, 193
 Savara, 186, 193
 Sayana, 186, 193
 Scotland, 130, 138, 139, 146
 Sea, Arabian, 41
 Rajputana, 42
 Shan Plateau, 30
 Silurian Period, 32, 72
 Simla, 34
 Sind, 39, 57, 160
 Gulf, 34
 Smith, Vincent, 39
 Smriti, 195
 Soil, 48
 Alluvial, 49
 Bengal, 60
 Clayey Loam, 67
 Drift, 49
 Glacial, 49
 Heavy Clay, 67
 Limy Clay, 67
 Loam, 66
 of the Old Delta, 60
 of the New Delta, 62
 of West Bengal, 63
 Residual, 49
 Results of Experiments on Ben-
 gal, 67
 Sandy Loam, 66
 Sandy Soil, 66
 South-East Trade Wind, 11
 Southern Continent, 32
 Spain, 130, 136, 169

INDEX

Srikrishna Tarkalankar, 194
 Stamp, Lord, 133
Statesman, 76
 Straits Settlements, 145
 Stump, Dudley, 20
 Subarnarekha R., 23, 24, 27, 64
Sukra-niti, 123
 Sulaiman, 34
 Sunderbans, 63, 95
 Surma Valley, 28, 47
 Sutlej R., 39, 41
Sutra, 191
 Sweden, 130, 131, 136, 138, 139, 146, 174
 Switzerland, 130, 131, 144, 146
 Sylhet, 44
 Jheel, 63

T

Tamralipti, 36
 Teesta R., 17, 18, 30, 38, 44, 46, 104
 Tehri, 29
 Temperature, 9-10
 Temporary Settlement, 216
 Lands under, 216-17
 Tenasserium, 30
 Terai, 9, 15
 Tertiary Period, 33, 34, 35, 38
 Tethys, 32, 33
Thakoranee Dassi V. Bisweswar Mukerjee
 Thar, 31
 Tibet, 32
 Tigris R., 38
 Tippera, 14, 28, 64, 74, 75, 77, 78, 79, 81, 83, 85, 89, 92, 93, 94, 95, 96, 97, 99, 100, 103, 105, 111, 114
 Todar Mal, 201
 Torrid Zone, 9
 Town, 114-5
 Triassic Period, 32, 33
 Tripura, 73, 91, 100
 Tropical Zone,
 Tropic of Cancer, 9, 11
 of Capricorn, 10
 Tsanpo R., 46
 Turkey, 169
 Turkestan, 33

U

United Kingdom, 131, 133, 134, 174, 178
 United Provinces, 29, 35, 36, 42, 87, 91, 109, 113, 141, 146, 155, 166, 174
 United States, 48, 65, 66, 67, 90, 118, 130, 133, 134, 136, 144, 146, 169, 172, 173, 174, 177, 180
 Usana, 191
 U. S. S. R., 91, 169
 Utilisation of the land, 65-85

V

Vasishta, 191, 193, 195
 Vernal Equinox, 11
 Vindhyas, 31, 35, 36
 Vrighaspati, 191
 Vyasa, 196
Vyavahar-Mayukha, 194

W

Wadia, 33, 41
 Wahinda R., 39
 Wartenburg, 138
 Washington, 54
 Wattal, 147, 148
 Western Bengal, 12
 Western Ghats, 11, 59
 Willcocks, Sir William, 19, 20, 25, 26, 30, 38
 William Thackeray, 210

Y

Yajnavalkya, 193, 196
 Yeats, M. W. W., 117
 Yugoslavia, 145
 Yunnan, 31

Z

Zezyat, 199

ERRATA

<i>Page</i>	<i>Line</i>	<i>Read</i>	<i>In place of</i>
2	6	problems	problems
9	8	inland	land
35	F.N. 3	233-6	223-6
35	F.N. 5	later	latter
38	16	success	sucess
50	8	remain	remains
51	27	oxidation	exidation
70	17	moderate	modrate
78	2	present	Present
120	1	Distribution	Districton
177	14	differences	difference
183	33	go	go on
186	31	communal	comunal
208	22	stable	state